PB81-116493

Analytical Studies for the U.S. Environmental Protection Agency. Volume II. Decision Making in the Environmental Protection Agency

(U.S.) National Research Council
Washington, DC

Prepared for

Environmental Protection Agency
Washington, DC

Jul 77

U.S. Department of Commerce
National Technical Information Service
NTIS

BIBLIOGRAPHIC DATA SHEET

1. Report No. ISBN 0-309-02627-X

2.

3. Recipient's Accession No. PB81-116493

4. Title and Subtitle Decision Making in the Environmental Protection Agency

5. Report Date Pub Date - 07/77

6.

7. Author(s) Committee on Environmental Decision Making, National Research Council

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
National Academy of Sciences
2101 Constitution Avenue
Washington, D.C. 20418

10. Project/Task/Work Unit No.

11. Contract/Grant No. 68-01-2430

12. Sponsoring Organization Name and Address
Environmental Protection Agency
401 M Street S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstracts

While examining current Environmental Protection Agency (EPA) decision-making processes, this report also suggests ways in which the EPA can respond more effectively to acquire and use scientific information in solving the problems of pollution control. The report recommends that the EPA state the objectives of its decisions, identify alternatives, and analyze the consequences of these alternatives; make use of the wide range of scientific and engineering expertise that exists outside the EPA; and take into account the barriers to the implementation of EPA regulations when the regulations are formulated.

17. Key Words and Document Analysis. 17a. Descriptors

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

18. Availability Statement paper copy available from National Academy of Sciences; microfiche from NTIS (paper copy from NAS: $8.75)

19. Security Class (This Report) UNCLASSIFIED

20. Security Class (This Page) UNCLASSIFIED

21. No. of Pages iii & 249

22. Price

PB81-116493

VOLUME II

Decision Making in the Environmental Protection Agency

NATIONAL ACADEMY OF ENGINEERING · NATIONAL ACADEMY OF SCIENCES · INSTITUTE OF MEDICINE

The National Research Council

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

ANALYTICAL STUDIES FOR THE U.S.
ENVIRONMENTAL PROTECTION AGENCY

VOLUME II

Decision Making in the Environmental Protection Agency

A report to the
U.S. Environmental Protection Agency
from the
Committee on Environmental Decision Making

Commission on Natural Resources
National Research Council

NATIONAL ACADEMY OF SCIENCES
Washington, D.C. 1977

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the Councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the Committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

This study was supported by the Environmental Protection Agency.
Contract No. 68-01-2430

Library of Congress Catalog Card Number 77-78394
International Standard Book Number 0-309-02627-1

Available from

Printing and Publishing Office
National Academy of Sciences
2101 Constitution Avenue
Washington, D.C. 20418

Printed in the United States of America

MEMBERS OF THE COMMITTEE ON ENVIRONMENTAL DECISION MAKING AND ITS PANELS

JACK P. RUINA *(Chairman)*, Department of Electrical Engineering, Massachusetts Institute of Technology

SPURGEON M. KEENY *(Vice Chairman)*, MITRE Corporation
MARIO C. BATTIGELLI, School of Medicine, University of North Carolina
SAMUEL G. BOORAS, Illinois Institute for Environmental Quality
JAMES N. BUTLER, Division of Engineering and Applied Physics, Harvard University
RICHARD M. CYERT, Carnegie-Mellon University
J. CLARENCE DAVIES, Conservation Foundation
ROBERT DORFMAN, Department of Economics, Harvard University
JAMES A. FAY, Department of Mechanical Engineering, Massachusetts Institute of Technology
MARVIN L. GOLDBERGER, Department of Physics, Princeton University
JOHN R. GOLDSMITH, Environmental Epidemiology Unit, California State Department of Public Health
HAROLD P. GREEN, National Law Center, George Washington University
MILTON HARRIS, Consultant, Washington, D.C.
N. WILLIAM HINES, School of Law, University of Iowa
CHARLES J. HITCH, Resources for the Future, Washington, D.C.
HELEN M. INGRAM, Institute of Government Research, University of Arizona
PHILIP L. JOHNSON, Oak Ridge Associated Universities
DANIEL A. OKUN, Department of Environmental Science and Engineering, University of North Carolina
HOWARD R. RAIFFA, Graduate School of Business Administration, Harvard University
ALBERT J. ROSENTHAL, School of Law, Columbia University
WILLIAM SCHWARTZ, School of Medicine, Tufts University
JOHN D. STEINBRUNER, School of Organization and Management, Yale University
RICHARD B. STEWART, School of Law, Harvard University
MYRON TRIBUS, Center for Advanced Engineering Study, Massachusetts Institute of Technology
FRED H. TSCHIRLEY, Department of Botany and Plant Pathology, Michigan State University

The Committee on Environmental Decision Making was formed and convened under the auspices of the Commission on Natural Resources and its Environmental Studies Board.

STAFF

ROBERT E. BURT
NATHAN J. KARCH
RAPHAEL G. KASPER
RICHARD W. LOWERRE
LAWRENCE E. MCCRAY

COMMISSION ON NATURAL RESOURCES

GORDON J.F. MACDONALD *(Chairman)*, Dartmouth College

WILLIAM C. ACKERMANN, Illinois State Water Survey
THOMAS D. BARROW, Exxon Corporation
JOHN E. CANTLON, Michigan State University
DAYTON H. CLEWELL, Mobil Oil Corporation
HAROLD L. JAMES, U.S. Geological Survey
JULIUS E. JOHNSON, Dow Chemical U.S.A.
ALLEN V. KNEESE, University of New Mexico
C.O. MCCORKLE, JR., University of California
H. WILLIAM MENARD, Scripps Institute of Oceanography
NORMAN A. PHILLIPS, National Oceanic and Atmospheric Administration
WILLIAM K. REILLY, The Conservation Foundation
ROBERT M. SOLOW, Massachusetts Institute of Technology
E. BRIGHT WILSON, Harvard University

Ex Officio Members

NORMAN HACKERMAN, Rice University (*Chairman*, Board on Energy Studies)
ELBURT F. OSBORN, Carnegie Institute of Washington (*Chairman*, Board on Mineral Resources)
GILBERT F. WHITE, University of Colorado (*Chairman*, Environmental Studies Board)
SYLVAN WITTWER, Michigan State University (*Chairman*, Board on Agriculture and Renewable Resources)

RICHARD A. CARPENTER, *Executive Director*

ENVIRONMENTAL STUDIES BOARD

GILBERT F. WHITE *(Chairman)*, University of Colorado

ALFRED M. BEETON, University of Michigan
JONATHAN N. BROWNELL, Patterson, Gibson, Noble, and Brownell
HENRY P. CAULFIELD, JR., Colorado State University
WILLIAM J. COPPOC, Office of Environmental Protection, Texaco, Incorporated
ROBERT DORFMAN, Harvard University
JAMES A. FAY, Massachusetts Institute of Technology
ESTELLA B. LEOPOLD, University of Washington
PERRY L. MCCARTY, Stanford University
DORN C. MCGRATH, JR., The George Washington University
NORTON NELSON, New York University Medical Center
VAUN A. NEWILL, Exxon Research & Engineering Company
DAVID REICHLE, Oak Ridge National Laboratories
M. GORDON WOLMAN, The Johns Hopkins University

THEODORE M. SCHAD, *Executive Secretary*

Contents

Foreword xi

Preface xv

1 *Introduction and Summary* 1

Introduction, 1

Specific Recommendations, 9

I DEVELOPMENT OF SPECIFIC STANDARDS AND REGULATIONS

2 *Framework for Decision Making* 25

▷ A Analysis in Support of Decision Making, 25

▷ B Barriers to the Implementation of EPA Regulations, 36

References, 43

3 *Information and Analysis for Decision Making* 45

▷ C Advice and Review from Scientists and Engineers outside EPA, 45

▷ D Dependence on Regulated Industries for Data and Analysis, 51

▷ E Scientific and Technical Research in Support of Decision Making, 58

▷ F Statutory Deadlines on Administrative Actions, 66

References, 72

4 *Procedural Considerations* 73

▷ G Procedural Requirements for Decision Making, 73

▷ H Interagency Review, 85

▷ I Judicial Review, 90

▷ J Public Participation, 96

References, 103

II DEVELOPMENT OF PROGRAM STRATEGIES

5 *Procedures for Designing and Maintaining Effective Programs* 109

▷ K Priorities, 109

▷ L Organizational Feedback, 119

References, 134

6 *New Program Strategies* 135

▷ M More Effective Sanctions, 135

▷ N Alternative Strategies, 141

▷ O EPA's Role under the National Environmental Policy Act, 150

APPENDIXES

A Summary of EPA Decisions Required by the Laws 189

B EPA and Its Programs 181

C EPA Procedures for Decision Making 197

D Quantitative Methods of Analysis 219

E Case Studies Prepared for the Committee on Environmental Decision Making 247

F Papers and Reports Prepared for the Committee on Environmental Decision Making 248

Foreword

This report is one of a series prepared by the National Research Council for the U.S. Environmental Protection Agency.

In June 1973 the Subcommittee on Agriculture, Environmental, and Consumer Protection of the Appropriations Committee of the U.S. House of Representatives held extensive hearings on the activities of EPA, and the ensuing appropriations bill for fiscal year 1974 directed the Agency to contract with the National Academy of Sciences for a series of analytical advisory studies (87 Stat. 482, PL 93-135). EPA and the Academy agreed upon a program that would respond to the Congressional intent by exploring two major areas: the process of acquisition and use of scientific and technical information in environmental regulatory decision making; and the analysis of selected current environmental problems. The Academy directed the National Research Council to formulate an approach to the analytical studies, and the National Research Council in turn designated the Commission on Natural Resources as the unit responsible for supervising the program.

The other studies in the series, and a diagram of the structure of the program are presented on the following pages. Each of the component studies has issued a report on its findings. Volume I of the series, *Perspectives on Technical Information for Environmental Protection*, is the report of the Steering Committee for Analytical Studies and the Commission on Natural Resources. It describes in detail the origins of the program and summarizes and comments on the more detailed findings and judgments in the other reports.

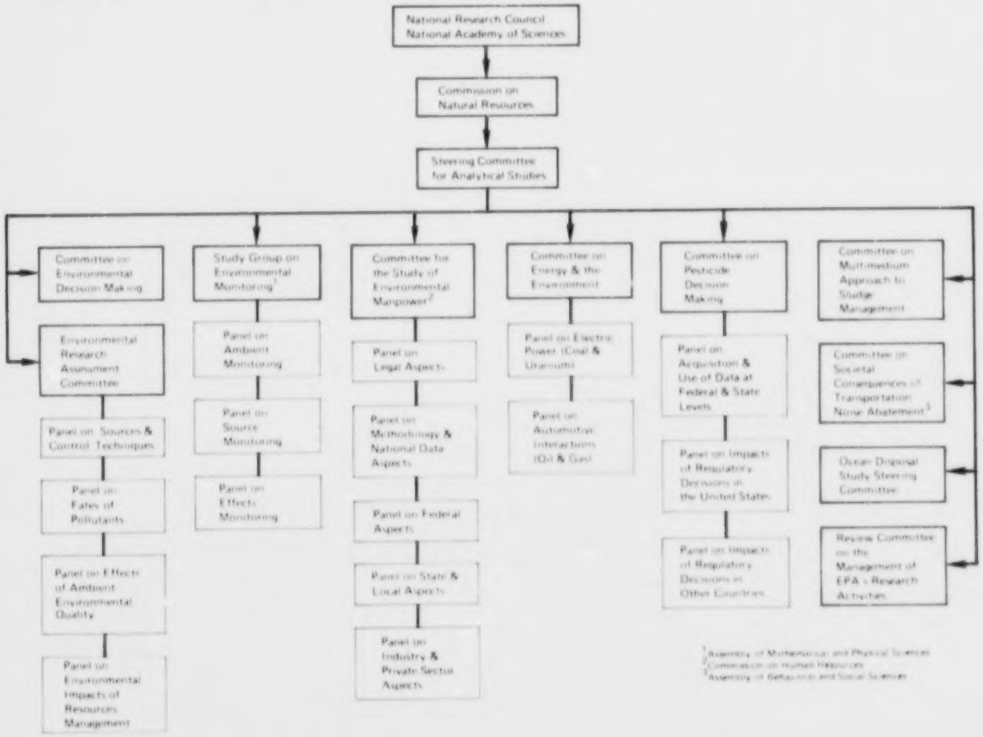
Components of the NRC Program of Analytical Studies for the U.S. Environmental Protection Agency

Project	Project Chairman	Sponsoring Unit of the NRC
Steering Committee for Analytical Studies (SCAS)	R. M. Solow	Commission on Natural Resources
Environmental Decision Making (CEDM)	J. P. Ruina	Environmental Studies Board, Committee on Public Engineering Policy
Environmental Research Assessment (ERAC)	J. M. Neuhold	Environmental Studies Board
Environmental Monitoring (SGEM)	J. W. Pratt	Committee on National Statistics, Environmental Studies Board, Numerical Data Advisory Board
Environmental Manpower (CSEM)	E. F. Gloyna	Commission on Human Resources
Energy and the Environment (CEE)	S. I. Auerbach	Board on Energy Studies
Pesticide Decision Making	W. G. Eden	Board on Agriculture and Renewable Resources, Environmental Studies Board
Multimedium Approach to Municipal Sludge Management	H. O. Banks	Environmental Studies Board
Societal Consequences of Transportation Noise Abatement	W. J. Baumol	Assembly of Behavioral and Social Sciences[b]
Disposal in the Marine Environment	D. S. Gorsline	Ocean Affairs Board
Review of Management of EPA's Research Activities	R. W. Berliner	Commission on Natural Resources

[a] In cooperation with the Building Research Advisory Board.

[b] In cooperation with the Building Research Advisory Board and the Transportation Research Board.

Structure of the NRC Program of Analytical Studies for the U.S. Environmental Protection Agency


National Research Council National Academy of Sciences
Commission on Natural Resources
Steering Committee for Analytical Studies
Committee on Environmental Decision Making
Environmental Research Assessment Committee
Panel on Sources & Control Techniques
Panel on Fates of Pollutants
Panel on Effects of Ambient Environmental Quality
Panel on Environmental Impacts of Resources Management
Study Group on Environmental Monitoring[1]
Panel on Ambient Monitoring
Panel on Source Monitoring
Panel on Effects Monitoring
Committee for the Study of Environmental Manpower[2]
Panel on Legal Aspects
Panel on Methodology & National Data Aspects
Panel on Federal Aspects
Panel on State & Local Aspects
Panel on Industry & Private Sector Aspects
Committee on Energy & the Environment
Panel on Electric Power (Coal & Uranium)
Panel on Automotive Interactions (Oil & Gas)
Committee on Pesticide Decision Making
Panel on Acquisition & Use of Data at Federal & State Levels
Panel on Impacts of Regulatory Decisions in the United States
Panel on Impacts of Regulatory Decisions in Other Countries
Committee on Multimedium Approach to Sludge Management
Committee on Societal Consequences of Transportation Noise Abatement[3]
Ocean Disposal Study Steering Committee
Review Committee on the Management of EPA's Research Activities

[1] Assembly of Mathematical and Physical Sciences
[2] Commission on Human Resources
[3] Assembly of Behavioral and Social Sciences

Preface

The Committee on Environmental Decision Making was established by the Environmental Studies Board (ESB) and the Committee on Public Engineering Policy (COPEP) to examine the process of decision making at the Environmental Protection Agency in order to make recommendations for the more effective use of scientific and technical information in making regulatory decisions.

Although the Committee studied recent EPA decisions in order to determine how the Agency has made decisions in the past, there was no attempt to evaluate the substance of those decisions; rather, the processes and procedures of the Agency were examined to determine how scientific and technical information entered (or did not enter) in the Agency's deliberations. (One large portion of EPA's responsibilities, the management of the construction grants program, was not considered by the Committee.)

In order to obtain background information, the Committee commissioned papers and reports on issues of interest and the staff prepared a number of case studies of EPA decisions. (A number of these documents will be available in Volumes IIa and IIb. For more information on the content and availability of these separate volumes see Appendixes E and F.) At various times the Committee met with representatives from EPA, industry, environmental groups, and other government agencies, and with judges who had been involved in environmental cases. In addition, representatives of the Committee visited EPA headquarters, regional offices, and several laboratories in the course of the study. To cover the broad range of issues involved in EPA decision making, the Committee established four panels (on Scientific and Technical Considerations, Organizational and Social Considerations, Legal Considerations, and Evaluative and Integrating Procedures) that considered various aspects of EPA decision making. The Panels reported their findings and conclusions to the whole Committee, which then prepared this report.

The Committee and staff wishes to acknowledge the help of the following consultants: Roxanne Arnold, Roland Fung, John Harris, Liza Kimball, Eric Smith, and particularly Eugene Seskin. Indispensable administrative support was provided by Christina Olson, Elizabeth Panos, and Joyce Shapiro and valuable editorial assistance was provided by Robert Rooney, Philippa Shepherd, and Estelle Miller.

Decision
Making in the
Environmental
Protection Agency

1 Introduction and Summary

INTRODUCTION

No simple statement can be made of what is at stake in environmental decision making; the measure of the stakes is too dependent on value judgments and on consequences that are not known. Yet, the potential effects of environmental degradation are enormous and the possible consequences of regulation are great as well. It has been suggested that a large proportion of cancer deaths, birth defects, and other effects on health may be traced to environmental factors, some of which may be amenable to EPA control. In fact, we do not know enough about the causes of these health effects, and we will not know enough in the immediate future. From another perspective, EPA is seen as having excessive authority over a wide range of industries. However, drastic economic consequences have not, in fact, occurred as a result of EPA actions, and it is difficult to imagine that they ever would.

In its short history, great demands have been made on EPA for action to protect the environment and, at the same time, major obstacles lay in the way of its attempts to act. The Agency was conceived at the height of popular support for environmental action. Clearly dissatisfied with earlier federal efforts at pollution control, the American electorate demanded strong new measures for environmental protection. Congress complied by passing, without serious opposition, a series of ambitious and explicit environmental bills prescribing administrative actions, and the burden of high expectations thus created has been borne by the Agency ever since.

EPA was composed of the same organizational units that had been publicly judged to be inadequate in the late 1960s. While EPA's public works projects received greatly augmented funds in the early 1970s, the new regulatory programs of EPA were not given resources sufficient to allow the Agency to transcend its bureaucratic heritage. EPA's budget and personnel levels continue to fall far short of the demands of the ambitious statutory mandates laid upon the Agency. In addition, the regulatory reach of the EPA program is probably unparalleled. The coverage of some regulatory agencies is as broad, affecting virtually all of American industrial firms, and the involvement of some agencies in the basic production decisions of regulated firms is as deep; but the EPA program has both features. The new laws required the Agency to become familiar with a vast set of newly regulated dischargers and to gain their cooperation within a very short time, a task further complicated by the fact that dischargers have every incentive to delay the imposition of new controls whenever feasible. The base of scientific and technical information available to the Agency was relatively weak. Thresholds of exposures to substances that would be harmful to man were highly uncertain, costs of abatement programs were unknown, and benefits to be derived from pollution abatement, although often great and significant, could not be quantified. The case for controls was thus hard to demonstrate, leaving EPA vulnerable to charges of setting rules that could not be substantiated.

One result of the clash of heightened expectations with powerful counterpressures has been a general sense of dissatisfaction on all sides with EPA's performance so far. In fact, however, when specific criticisms of EPA decision making are traced to their roots, the problems more frequently are seen to derive from the stringent directives of the environmental statutes than from faulty administrative action. When this is recognized, criticism of the Agency leads to the question of EPA's responsibility to seek changes in the law.

As a matter of policy, EPA leadership decided not to ask Congress to amend the Agency's stated mission in its early years. The first imperative was to give the new approaches to pollution control a fair chance of proving effective. The Agency has promoted legislation giving it new authority in areas where it saw a need, but a reluctance to request statutory alteration in existing programs still persists. There is concern that requests to Congress to correct unworkable provisions might lead to unraveling of others that the Agency feels are sound.

This report does not analyze in detail the legislation on which EPA decision making is founded, but the time seems to be approaching when evaluation of some of the legislation would be both possible and appropriate. In fact, implementation of some of the recommendations in this report would entail Congressional action. Some of the information that Congress needs to evaluate the effectiveness of the current legislative approach to environmental protection could best come from EPA, and ways must be found to assure that it is systematically supplied.

EPA's overwhelming tasks in its first years were: to develop (often under tight statutory deadlines) fair and reasonable regulations that could stand the test of judicial review; to organize and staff the Agency to handle, on a continuing basis, its new, diverse, and complex responsibilities; to organize a program of implementation; to develop a program to strengthen its base of scientific, technical, and economic data and analyses; and to maintain its base of popular and political support in spite of inevitable conflict with other national interests. The main focus of EPA activity, however, was on carrying out its statutory mandate to develop regulations.

The period was characterized by zeal, emotion, and controversy, as one might have expected. The new Agency, with its vast responsibilities, had a great deal of popular and Congressional support, but it also appeared to threaten large and powerful segments of the U.S. economy.

Today, EPA is under less pressure to establish its own credibility and, in some programs, less frequently pressed for quick regulatory action. The time seems right for the Agency to consider modifying its decision-making processes in a way that makes more effective use of both the experience of the Agency and the scientific and technical resources of the nation.

STATUTORY FRAMEWORK FOR EPA DECISIONS

EPA's decisions are made within a complex legal framework that is the source of authority for EPA actions. The framework is provided primarily by statutes enacted by Congress in the 1970s proclaiming national goals of rapid improvement and protection of the environment and protection of the public against hazards to its health. The statutes also reflect political compromise and Congressional concern regarding the ability and commitment of the Executive Branch to implement and enforce pollution control. The laws do not allow EPA unlimited discretion in achieving those goals at least cost; instead, the statutes include principles, limitations, and procedural requirements that guide the exercise of EPA's authority.

The major environmental statutes include:

- The Clean Air Amendments of 1970
- The Federal Water Pollution Control Act Amendments of 1972
- The Federal Environmental Pesticide Control Act of 1972

- The Noise Control Act of 1972
- The Safe Drinking Water Act of 1974
- The Resource Conservation and Recovery Act of 1976
- The Toxic Substances Control Act of 1976.

(See Appendix A for descriptions of the major provisions of the laws.)

The statutes rely on a basic strategy of direct regulation, requiring EPA to identify sources of pollution and to restrict the activities of those sources. The precise means of regulation differ from law to law, but in implementing the regulatory authority in any law, EPA's foremost responsibility is the setting of national standards and regulations, such as national ambient air quality standards or pesticide registration regulations. The standard-setting process is followed by EPA decisions concerning application of standards and regulations to particular cases, approval or disapproval of state plans to administer a pollution program, and enforcement of the law and regulations in the event of violations by polluters.

Congress, however, has imposed many constraints on the exercise of EPA's authority to set national regulations. A number of restrictions within the laws limit the alternatives available to EPA and the factors that can be considered in making any decision. Under the Clean Air Act, decisions by EPA about the levels of ambient air quality standards for most pollutants and decisions to approve or disapprove state plans designed to attain air quality standards are to be made, not on the basis of economic consequences or technical feasibility, but on the basis of protection of the public health. In contrast, under the Federal Environmental Pesticide Control Act, EPA cannot now cancel the registration of a pesticide because it poses an unreasonable risk to man and the environment, unless the impact of cancellation upon " . . . the production and prices of agricultural commodities, retail food prices . . . " has been taken into account. At times, Congress has even set specific standards in the law, as in the Clean Air Act when it originally determined that by 1975 average emissions of certain pollutants from automobiles should be reduced to 90 percent of the 1970 and 1971 levels.

The statutes also influence EPA's decisions by setting deadlines for the actions and procedural steps to be followed by the Agency, such as the submission of proposed pesticide regulations to the Department of Agriculture for review. Even with these requirements and limitations, EPA retains considerable flexibility in designing and carrying out its programs. Greater use of this flexibility is emphasized in the recommendations of the report.

While the laws establish a general framework and specific directives for EPA decisions, it is important to recognize that no statute is unequivocal in its mandates. Environmental statutes emerge as products of political compromise. Even the most ringing declaration of Congressional purpose to defend, maintain, and enhance environmental values must be read with caution. It is common legislative practice to include such declarations, but to impede their implementation with restrictive statutory language or procedures that make enforcement more difficult. For various reasons, it is very difficult for Congress to write a finely tuned, unambiguous law. Congress frequently evades some critical issues and passes them to the regulatory agencies for resolution without supplying either the authority or the resources to find the best solutions.

The laws have resulted in some major improvements in the nation's environment, and they have created a framework for continuous response to pollution problems. They have not, however, eliminated problems and delays in effective environmental control. Ideal solutions to the inherent difficulties of enacting statutes to solve uncertain, complex, and changing problems cannot, in fact, be provided by the law.

DECISION MAKING AT EPA

The decisions made by EPA under its statutory authority are seldom simple resolutions of factual disputes; instead, they involve complex technical issues and controversial value judgments that can affect significant numbers of persons and activities. One might expect, therefore, to find standard practices within EPA for developing and using internal expertise and for responding to concerns of those outside the Agency. But while systematic procedures (see Appendix C) have been developed and used by EPA for setting standards, rules, and regulations (the type of decision discussed in Part I of this report), such standard practices have not been developed for setting priorities and reevaluating program strategies (the type of decision discussed in Part II).

EPA's organization is based, to a large extent, upon its particular regulatory programs. (A brief review of EPA's organization and programs is given in Appendix B.) Decisions about water pollution, for example, are primarily the responsibility of the Office of Water and Hazardous Materials. There are five other major divisions: the Office of Air and Waste Management, the Office of Research and Development, the Office of Planning and Management, and Office of Enforcement, and the new Office of Toxic Substances; and there are 10 EPA Regional Offices located throughout the United States. To coordinate the participation of these offices in the development of standards and regulations, EPA has established a procedure in which a working group made up of representatives of the appropriate EPA offices drafts the regulation, which is then reviewed by a standing steering committee made up of top Agency officials. Approximately 60 EPA decisions each year are subject to this procedure, but some decisions are still made on an ad hoc basis and some decisions about water pollution and pesticide regulations have not been a result of the standard EPA decision-making practices.

In addition to providing internal coordination, EPA's decision-making procedures must permit interests outside the Agency to influence the decisions. EPA's decisions necessarily involve value judgments, and the decisions must be made within a system of political constraints. The Administrator of EPA is by law the final authority on any single decision; however, the position is filled by Presidential appointment, and the Administrator continues in it at the President's pleasure. In addition, regulatory agencies are strongly influenced and constrained by the budgetary and manpower recommendations of the Office of Management and Budget, by the oversight of Congress, and by the impact of Congressional investigations.

EPA must necessarily temper its actions and decisions with some sense of political reality. Indeed, political realities may preclude regulatory actions that appear to be clearly mandated, and even essential, under applicable law. Moreover, because regulatory decisions made by EPA in Washington must be administered either by the EPA regional offices that are headed by relatively independent appointees or by autonomous state and local governments, the Agency's decisions must be acceptable to an even broader range of political interests and must anticipate the practical problems in implementation.

RECOMMENDATIONS FOR IMPROVED DECISION-MAKING PRACTICES

This report presents a number of recommendations for enhancing the use and acquisition of scientific and technical information in EPA decision making and for improving the Agency's decision-making processes and procedures. In developing these recommendations, the Committee paid particular attention to three aspects of decision making: the need for explicitness and analytical treatment of the consequences of a range of alternative EPA actions, the need for openness and access, and the importance and value of taking into account considerations of implementation of EPA decisions.

The report recommends that, in making decisions on environmental protection, EPA identify alternative courses of action that may meet its objectives and identify and evaluate potential consequences of each course. The Agency's analysis should include explicit identification of areas of uncertainty and determination of the importance of resolving them.

The recommendation is based on the belief that such a systematic analysis would make clearer, both to the Agency and to the public, how and where technical data, value judgments, and assumptions were used in arriving at conclusions. Too often public discussion of environmental protection decisions focuses upon peripheral rather than central issues. Systematic analysis can provide a framework for discussion and for the identification and consideration of the critical issues. In addition, analysis creates a demand for information and can thus give impetus and direction to environmental research programs, both within and outside EPA.

The report recognizes that analysis is only a tool for the decision maker in a systematic consideration of available information. In the end, decisions must depend upon judgment, and analysis can only aid in the process by assuring that the decision maker is aware of alternatives, consequences, and the uncertainties involved.

The report also recognizes the dependence of EPA decisions on scientific data and analysis; it recommends that a closer relationship be developed between the Agency's research activities and its decision-making processes and that data and analyses used in decisions have early and routine review to ensure that all relevant information is considered and to reduce the possibility of misinterpretation or misuse of scientific results. The review process, as well as the provision of independent scientific advice and evaluations of the technical basis for decisions, can be greatly aided if more effective use is made of the wide range of scientific and engineering expertise that exists outside the Agency.

The report also calls attention to EPA's failure to establish ties with and to provide support for long-term environmental research activities outside the Agency and the need for greatly enhancing our knowledge of basic physical and biological processes related to environmental degradation and repair.

Any analysis of the consequences of EPA actions must take account of uncertainties in the available information. There will almost always be uncertainties in the data, partly because of the complexity of the problems and partly because the amount of time permitted for decision making is often too short to allow new research projects to be undertaken to fill gaps in available knowledge. A clear exposition of uncertainties, however, can be of considerable advantage to a decision maker both in affording a realistic view of the state of knowledge and in providing guidance in the design and performance of research projects whose results might have major impacts on decisions.

The report does not recommend a complete, detailed analysis of all the costs and benefits of all EPA actions (although such analysis might be warranted for certain critical decisions). Rather what is suggested is a systematic identification of alternative courses of action and their consequences. Where possible, effects of actions should be described quantitatively; where, as is often the case, effects are not amenable to quantification, qualitative descriptions of consequences can be useful in providing decision makers with an understanding of the extent to which various alternatives achieve the Agency's objectives.

Decision-making processes at an agency like EPA should be carried out openly and should provide easy access for affected parties. This would allow new information and new viewpoints to be introduced in the process and would permit review by outside parties of the assumptions, information, and analysis that form the bases of Agency decisions. The result would be more credible decisions, presumably more carefully based upon available information and less subject to the possibility that important information or viewpoints will have been neglected. Openness and access carry with them some potential problems. Their abuse can cause unnecessary delay, although experience at EPA and other agencies has demonstrated that this is not a necessary result of an open decision process. Further, openness about decisions that may be based upon highly uncertain or incomplete information may render the decisions more vulnerable to criticism. While this may be true, it should be noted that unnecessary secrecy can also invite criticism.

Openness is already a characteristic of many EPA decisions; this report contains some suggestions for continuing this openness and facilitating access to the decision-making process, among them provisions for outside review of information, changes that would expedite procedures and make information and records more easily accessible to the public, and provisions for experimenting with funding for citizen group participation.

No matter how open and explicit a decision process is, it will fail to achieve its objectives if it neglects the consideration of problems of implementation. This is particularly important for EPA at this time. The Agency has promulgated many standards, guidelines, and regulations, but environmental quality will improve only if they are effectively translated into action. Since EPA often has little direct control over the implementation of environmental programs, it is important that, in developing programs of environmental control, it consider potential difficulties in implementation that may be encountered by state or local authorities. This may require EPA to devise new approaches to implementing programs and will certainly require that the Agency develop a better understanding of various implementation strategies. The report also recommends that the Agency experiment with more cost effective environmental management strategies including greater use of economic incentives, including effluent charges.

There are certain apparent constraints on EPA that were found to have few, if any, detrimental consequences for the Agency's decision-making process. Judicial review of EPA decisions has had, the Committee feels, beneficial effects on the Agency's decision making. So too has the interagency review process, at least in recent years. Even the strict deadlines for EPA administrative actions, which have been the subject of strenuous criticism have, on balance, aided the Agency in its mission.

In each aspect of decision making—explicitness, openness, and implementation—this report has suggestions for improvement. In some instances, EPA has already taken some of the steps recommended here; and this report, understandably, urges a continuation of them. In other cases, EPA does, in particular instances or certain subprograms, what might be done on a more regular basis. The result is that many of the recommendations of the report are incremental and evolutionary in nature. In a few cases (particularly concerning the Agency's relationship to and support of environmental research efforts, and consideration of potential problems in implementation) more significant changes are indicated. Here the report suggests general directions for shifts in emphasis in Agency policy.

The recommendations in this report derive from careful study of EPA practice. They are made in a spirit of sympathy for the problems inherent in the complex responsibilities of the Agency, and in recognition of the need for changes in policy and practice that will make the Agency dynamic, flexible, and credible to the public and to the scientific and industrial communities whose knowledge and cooperation it requires.

SPECIFIC RECOMMENDATIONS

A. ANALYSIS IN SUPPORT OF DECISION MAKING

Although EPA's elaborate procedures for developing standards and regulations have significantly improved the quality of analysis by assuring open review of proposed actions, the analysis nevertheless often treats important factors inadequately. In its current decision-making processes, the Agency does not consistently include a systematic and comprehensive consideration of feasible alternatives.

- *EPA's decisions on standards and regulations should be supported by analyses that explicitly state the objectives of the decisions, identify feasible alternatives, evaluate (quantitatively, to the extent possible) the consequences of each alternative decision, explore potential problems in implementation, and indicate and examine the degree of uncertainty about the effects of EPA actions. The analyses should be available to the public.*

Systematic and well documented analyses could substantially improve the quality of EPA decisions by providing a framework for discussion and for public understanding of the factors that enter the decision process. The analyses would make possible the generation and evaluation of a more complete set of regulatory alternatives. Routine consideration of potential problems of implementing regulations and standards would help assure the practicality of EPA decisions. The careful consideration of uncertainties in available information and in the analyses would be useful both in directing the Agency's research efforts toward the resolution of those problems that appear to be particularly critical for decisions and in enhancing the credibility of EPA decisions. Even where existing legislation limits EPA's freedom to choose alternatives or consider certain factors, the Agency should assume responsibility for examining the consequences of various courses of action and making the analytic results available to the public.

B. BARRIERS TO THE IMPLEMENTATION OF EPA REGULATIONS

Many EPA regulations are implemented by heterogeneous and relatively autonomous federal, state, and local government entities that have limited resources and varied incentives and constraints. Current EPA decision-making practices entail inadequate efforts to routinely consider the practicality of implementation by these different government entities. The failure to account for barriers to implementation can result in effects different from those intended when a regulation is published.

- *EPA should systematically take account of the difficulties of translating its rules into environmental action at the local level. The assessment of resource constraints and of other qualitative barriers to implementation should be an important concern in the formulation of new EPA regulations.*

For regulatory policies that entail activity by authorities outside headquarters, EPA should determine whether the full range of federal, state, and local government resources required for implementation are available, and when they are not, the Agency should either adopt an alternative policy with more realistic resource requirements or redeploy resources to meet anticipated needs or both. EPA can use program grants to states and localities for this purpose.

Those responsible for developing new regulations should also assess other qualitative impediments to implementation by states and localities. To help assure sensitivity to these practical considerations EPA should routinely prepare a summary declaration of implementation prospects for new regulations, covering such factors as conflicting organizational interests, lack of adequate information on performance by dischargers, and inappropriate incentives and disincentives for regulated entities, and the Agency should make this analysis available for critical review and comment by field authorities.

C. ADVICE AND REVIEW FROM SCIENTISTS AND ENGINEERS OUTSIDE EPA

EPA often relies on previously unpublished or unreviewed data; this places a special burden on the Agency to make certain that the scientific and technical basis for its decisions is accurate and reliable. In addition, EPA does not have a regular and effective channel for advice to the Administrator from outside scientists and engineers, with the result that independent scientific judgments have not always been provided to the Administrator.

- *Scientific and technical data and analyses used in decision making should be reviewed routinely at an early stage to assure that all relevant data are considered and to reduce the possibility of misinterpretation or misuse of scientific results. In this process EPA will be greatly aided by the wide range of scientific and engineering expertise that exists outside the Agency. The reviews should be available to the public as a matter of course.*

- *On decisions that set significant precedents or have a substantial impact on public health or welfare or on public or private expenditures, the Administrator personally should have access to independent scientific advice and evaluations of the overall technical basis for decisions.*

This can best be accomplished by increasing the responsibilities of the existing Science Advisory Board (SAB) so that its chairman would serve full time for a fixed term and would convey independent evaluations of scientific and technical data and analyses directly to the Administrator.

In addition, the Chairman of the SAB should have explicit authority to initiate SAB activity on issues for which he or she judges scientific and technical advice to be warranted.

D. DEPENDENCE ON REGULATED INDUSTRIES FOR DATA AND ANALYSIS

EPA is inevitably dependent on the industries it regulates for much of the technical and economic information it uses in decision making. The impact of many decisions on industry creates a potential conflict of interest that may cause industry either inadvertently or intentionally to distort or withhold necessary information. EPA is particularly dependent on industrial data for: (1) the determination of the toxic effects of substances released to the environment; and (2) the assessment of the costs and technical feasibility of pollution control devices and of engineering alternatives in production processes to achieve pollution control.

- *EPA should develop sufficient scientific and technical expertise within the Agency or through independent institutions and should institute procedures to assure the quality, reliability, relevance, and completeness of data provided by industry for EPA's use.*

EPA should extend its development and publication of guidelines and protocols to apply to all toxicological testing and should insure their use. This is particularly important now that legislation to control commercially available toxic substances has been enacted. In addition, laboratories performing toxicological tests should be certified as having acceptable facilities, personnel, and standards of performance, and EPA should eventually accept data only from certified laboratories. A program of "spot checks" of certified laboratories, and selective audits of reported results, should be undertaken to monitor the maintenance of standards for toxicological testing.

To minimize its dependence on industry for information on pollution control technology or industrial processes, EPA should use and support those few independent experts in this area currently in government laboratories, universities, and research organizations. Where independent expertise in areas central to EPA's interests and responsibilities does not exist, the Agency should develop technical programs consisting primarily of research and development activities within EPA, in other governmental laboratories, or in independent institutions so that appropriate expertise can be developed and maintained.

E. SCIENTIFIC AND TECHNICAL RESEARCH IN SUPPORT OF DECISION MAKING

EPA's research and development programs alone are not adequate to serve either its current requirements for technical data and analyses or its long-term need to expand knowledge of the physical, biological, economic, and social phenomena related to problems of environmental regulation.

- *The principal role of EPA's in-house laboratories should be to perform research and supply technical expertise responsive to immediate Agency needs. These laboratories should be assessed for the quality and relevance of their work and their efforts redirected where necessary. The exchange of information and views between the research and development activities and the regulatory activities of the Agency should be improved, and the scientific leaders in EPA should be more deeply involved in the regulatory decision-making process.*

- *In those technical areas in which in-house capability is neither adequate nor feasible to develop (given the realities of political and bureaucratic constraints), EPA should use research centers outside the Agency; research that can better be done in other existing governmental laboratories, such as certain studies of health effects, should be carried out in those laboratories and supported by EPA.*

- *EPA should support a strong, stable, long-term program in environmental research in areas central to its regulatory responsibilities.*

Such research is best performed in institutions insulated from the inevitable day-to-day pressures of a regulatory agency. In addition to providing needed information, such a long-term program would assure development of a base of scientific and technical expertise and of facilities for training scientists and engineers who could eventually serve the federal government, state governments, industry, local communities, and public interest groups.

F. STATUTORY DEADLINES ON ADMINISTRATIVE ACTIONS

At times, statutory deadlines on EPA administrative actions have had the disadvantage of forcing the Agency to make decisions without the benefit of new, potentially useful information; but, on balance, they have had a beneficial effect on the Agency's decision making. The major disadvantage of deadlines could be removed if statutes were to permit extensions in cases in which additional information, essential to sound decision making, would be available in a reasonable amount of time.

- *Statutory deadlines should continue to be imposed on EPA's administrative actions. They should reflect a realistic view of the time required to make a reasonable assessment of available information. There should be provisions permitting EPA to extend deadlines under certain conditions and for specified periods.*

Any authority granted EPA to use extension provisions should be conditional on the Agency establishing that: (a) it requires additional time to gather or interpret technical information identified by EPA as essential to a decision; (b) it has made an effort in good faith to obtain this information; and (c) it has considered the adverse effects of postponement. When EPA has decided on the need for and duration of an extension, it should issue a public notice well in advance of the original deadline. EPA's decision should be subject to review by a federal Court of Appeals at the time of the public notice.

In the case of deadlines for submission of comment by interested parties on EPA's proposed rule making, there is a need to provide more time for better informed and more effective comment.

G. PROCEDURAL REQUIREMENTS FOR DECISION MAKING

Traditional procedural requirements established by statutes and court decisions for agency action have not always been well suited to the types of decisions made by EPA. As a result, EPA, under the direction of federal courts and on its own initiative, has experimented with innovations in procedures. A number of these innovations have had a beneficial effect on the decision-making process and can be used more widely. Several additional changes in the procedures could be developed to assist in decision making and to make the decision-making process more open to external review.

- *EPA should make greater use of procedural innovations developed within EPA and other federal agencies that, when combined with steps to increase openness in the Agency and the use of explicit analysis, will reduce the need to rely on formal procedures characteristic of trials and adjudications.*

Unless formal trial procedures are required by law, EPA should use procedures that may be less time consuming and expensive than trial-type procedures, such as the exchange of documents and informal questioning. Such procedures should neither materially reduce the consideration of scientific and technical information, nor deny parties fairness or due process of law.

Formal trial procedures generally should not be imposed on EPA decision-making processes; however, when Congress has chosen to do so, steps should be taken to streamline the procedures.

EPA should institute a more orderly procedure for compiling the relevant documentary record and making its contents easily available to the public. In addition, EPA should explicitly define and adhere to policies stating which information submitted by regulated parties and which internal memoranda should be available to the public.

EPA should make public an understandable summary of the rationale for each regulatory decision (including decisions not to take action) by publishing at the time of notice of proposed rule making a complete statement of the basis for its findings and its reasoning, including descriptions of (1) the scientific, economic, and other information (including information on statutory requirements and judicial decisions) relied on to evaluate the alternatives and the uncertainties in the information; (2) the analyses used in making the decision; and (3) the relative importance given to conflicting considerations in reaching the decision. Revisions of this statement should be included within the preamble to the final decision.

H. INTERAGENCY REVIEW

The requirement that proposed and final EPA regulations be circulated for formal review to other federal agencies and the Office of Management and Budget (OMB) prior to publication has had a positive effect on the Agency's decisions. Environmentalists have expressed concern that the reviews may lead to undue influence by those who emphasize national goals that conflict with environmental improvement. Although experience in a few cases has supported this concern, it is overshadowed by the improved EPA analysis of the consequences of its actions that has resulted, at least in part, from the review process. Interagency review can, however, unnecessarily delay the promulgation of EPA rules.

- *For proposed rules, present procedures for interagency review should be retained, except that they should be conducted concurrently with public notice-and-comment procedures rather than preceding them. Interagency review of final regulations should be greatly expedited. Some of the time* *saved by these changes should be used to extend the period for outside comments on proposed rules and to introduce a short period for submission of replies to the first round of comments.*

The prescribed procedural change would allow extension of the review-and-comment period both for the interested executive agencies and for private parties without lengthening the total duration of the decision process.

I. JUDICIAL REVIEW

Judicial review of EPA's administrative actions has played a major role in shaping and improving the Agency's decision-making process. The judicial review process has impeded EPA's programs only when federal courts have given conflicting interpretations to statutes intended to be administered uniformly throughout the country.

- *The current structure and standards for judicial review should be maintained with the exception that legislative changes should be made to provide that certain EPA decisions that apply uniformly over the nation be reviewed only in the U.S. Court of Appeals for the District of Columbia.*

J. PUBLIC PARTICIPATION

Citizen organizations have played a significant role in EPA's development and implementation of environmental policy. However, the extent of their involvement is limited by the amount of funds available for public participation in EPA and judicial proceedings.

- *EPA, perhaps through an impartial body, should provide some of the financial support of groups or individuals who can contribute to rule making or adjudicatory proceedings by raising new issues or by submitting additional assessments or analyses of relevant issues. To gain an understanding of difficulties of implementation, the Agency should experiment with means for providing such support.*

Determination of eligibility and amount of award should be based upon an applicant's demonstration of potential contribution to the proceedings (that would not otherwise be made by other participants) and of financial need. EPA should allocate a fixed sum for a public participation program that reflects the general experience with contributions of citizen groups.

In addition to this program of participation in administrative proceedings before EPA, court fee awards should be extended to all types of environmental litigation by statutory change where necessary. Existing statutory citizen suit provisions should be expanded by enacting for each EPA statute a uniform provision to deal with all aspects of suits initiated by citizens.

EPA's current means of awarding grants and contracts should be used to a greater extent to solicit or sponsor citizen group research and public education relevant to regulatory issues.

K. PRIORITIES

The establishment of priorities for EPA programs has been heavily influenced by factors beyond the Agency's control. At least until recently the most significant external factor was the detailed legislative direction written into the major environmental statutes. However, within the statutory requirements EPA has a great deal of discretion in establishing its priorities. The Agency is now entering a period in which most of the action-forcing deadlines in the statutes have passed and the laws' mandates are thus no longer as significant in establishing Agency priorities as they were. Continued responsiveness to external forces is appropriate, providing internal safeguards are set up against unproductive uses of Agency resources. Current Agency procedures for setting priorities do not assure that, within the discretion allowed by Congress, EPA resources are routinely assigned where there is greatest need and opportunity for environmental protection.

- *EPA's priorities should be established more explicitly, openly, and systematically to achieve the greatest expected improvement in environmental quality with available pollution control resources; ideally, the estimation of expected improvement in environmental quality should be based on quantitative measures of environmental conditions.*

Several improvements are required. (1) For each EPA program area, decisions about which pollution problems the program will address, and the long-term control strategy for each, should culminate in a regularly updated strategy document that is analytic in character. This document should lay out the current scientific basis for the chosen strategy and should include attempts to estimate the expected environmental improvement. (2) The Agency should better integrate the various components of its present priority-setting procedures; in particular, short-term priorities and decisions about annual resource allocations within the Agency should be based on a logical relationship to stated longer-term program goals and strategies. (3) Documents supporting the establishment of priorities should make clear what assumptions are used to relate proposed actions to anticipated environmental consequences, and the uncertainties inherent in these assumptions should be used as indicators of the Agency's research needs. (4) Drafts of priority documents should be available for outside review both as a check on EPA's facts and analyses and to facilitate communication of EPA program goals both within and outside the Agency. Suitable modification of current EPA procedures can provide the necessary improvement without burdensome administrative cost.

L. ORGANIZATIONAL FEEDBACK

EPA has not adequately developed or used information on the effectiveness of its past decisions. Agency data management practices make it difficult to identify long-term trends in environmental quality, and monitoring systems provide little information that is useful in the formulation of specific regulations or the evaluation of EPA programs. In addition, there is too little objective information available to headquarters decision makers on incentives and disincentives affecting the actions of local implementing authorities and individual dischargers. The Agency is missing opportunities to learn from its first five years of experience in making major regulatory decisions.

- *The Agency should initiate programs to assure feedback information on the implications of its actions in three areas.*

Environmental indicators: To better assess the ultimate environmental impacts of its actions, EPA should improve its use of monitoring data in decision making and should develop management-oriented environmental indicators that can be used to gauge environmental progress.

The Agency should improve its collection and, more particularly, its analysis of environmental data so that it has a usable, reliable, and timely set of measures of environmental conditions. A set of reliable environmental indicators should be selected and used to enhance EPA's ability to evaluate past program effectiveness on a regular basis, to help set program priorities, and to facilitate analysis of policy alternatives for new regulations. Summary data should be reported to the public on a regular and consistent basis so that long-term environmental trends can be identified and appreciated.

Implementation studies: To improve its understanding of the pragmatic problems of applying regulations to individual dischargers, EPA should initiate a regular program of implementation studies. As part of the program, EPA should reexamine the effectiveness of its formal reporting system and its practices for awarding program grants to state and local governments.

EPA should establish a continuing program of special studies to generate and evaluate information on the outcomes of past regulatory actions. These implementation studies should examine factors that affect the actual application of these regulations to dischargers, and should assess any discrepancies between intended and observed outcomes. The results of these studies will help the Agency to assess the relative merits of the various administrative approaches that have been tried by different regional offices, states, and localities.

Retrospective analysis: To improve analyses supporting regulatory decisions, the Agency should initiate a series of retrospective reviews of the adequacy of past analyses.

A somewhat smaller study effort should be devoted to reviews of the quality and adequacy of policy analyses for a sample of past EPA regulations. These reviews would elucidate the relative value of alternative information-handling procedures, provide insights into the accuracy of data sources, and reveal "blind spots" (for instance, faulty assumptions about the ease of implementing a regulation) and their causes.

M. MORE EFFECTIVE SANCTIONS

Speed and flexibility of application and credibility are important qualities of the sanctions that can be applied for violations of environmental regulations. Among possible types of sanctions, civil penalties that can be imposed by administrative action are particularly notable for these qualities; however, a number of statutes administered by EPA do not explicitly provide the Agency with civil penalty authority. In addition, existing "all or nothing" financial sanctions against state and local governments not in compliance with EPA grant requirements fail to provide the necessary flexibility and credibility to be effective.

- *EPA should vigorously use its authority to assess civil penalties without going to court. Where such authority has not yet been conferred, statutes should be amended to increase the availability and utility of such sanctions.*

The authority to assess civil penalties by administrative rather than judicial action should include the use of (a) penalties to deter one time or noncontinuous violations (such as the misuse of a pesticide, the failure to report emission data to EPA, or the unlawful spill of a pollutant), and (b) noncompliance fees to encourage the quick adoption of abatement measures by sources emitting pollution in excess of EPA standards.

- *EPA should modify its sanctions under grant requirements to provide for the use of less severe penalties than withdrawal of the grant. The Agency should also develop alternative sanctions that would create incentives for the states to implement environmental regulations effectively.*

N. ALTERNATIVE STRATEGIES

The current regulatory mode used for pollution control does not provide for significant attention to cost–effectiveness nor does it provide for the use of economic incentives, including effluent charges. Operating entirely within the regulatory mode, the Agency has opportunities for improved cost–effectiveness in achieving environmental objectives. The opportunities could be realized, in some cases, without alteration of the current legislative framework; in other cases, statutory constraints would have to be changed. Effluent charges, used either in conjunction with or as a substitute for regulation, have some theoretical advantages and may enable EPA to achieve the goals of environmental protection with greater cost–effectiveness.

- *The current regulatory framework used by EPA should be revised and supplemented to allow the use of management strategies that may be more cost–effective in achieving environmental objectives and that experiment with greater use of economic incentives, including effluent charges.*

The potential costs associated with constraints on cost–effective means of achieving environmental objectives, such as some statutory requirements of uniformity, should be examined. Where such costs are substantial they should be brought to the attention of Congress.

In general, the regulatory mode is preferable when there is an unwillingness to run the risk of not achieving some overriding environmental objective (such as the elimination of a highly toxic substance). The effluent charge strategy has most promise in those cases where lack of knowledge makes the optimal level of ambient standards uncertain, and where the aim is to achieve significant improvements in the environment with minimal adverse impact on the economy.

O. EPA'S ROLE UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT

EPA has a statutory obligation to act as an environmental advocate within the federal government through its review of the environmental impact statements of other federal agencies. EPA review should be superior to private litigation as a prompt and informed means for assessing impact statement adequacy, and for this reason EPA should carry out its review more vigorously.

- *EPA should devote more resources, including sufficient technical staff support, to the discharge of its review function. The Agency should comment at the earliest possible opportunity on expected adverse impacts caused or condoned by the actions of other agencies, emphasizing impacts likely to involve the exercise of EPA regulatory authority at a later date.*

I

DEVELOPMENT OF SPECIFIC STANDARDS AND REGULATIONS

2 Framework for Decision Making

A. ANALYSIS IN SUPPORT OF DECISION MAKING

Although EPA's elaborate procedures for developing standards and regulations have significantly improved the quality of analysis by assuring open review of proposed actions, the analysis nevertheless often treats important factors inadequately. In its current decision-making processes, the Agency does not consistently include a systematic and comprehensive consideration of feasible alternatives.

- *EPA's decisions on standards and regulations should be supported by analyses that explicitly state the objectives of the decisions, identify feasible alternatives, evaluate (quantitatively, to the extent possible) the consequences of each alternative decision, explore potential problems in implementation, and indicate and examine the degree of uncertainty about the effects of EPA actions. The analyses should be available to the public.*

Systematic and well documented analyses could substantially improve the quality of EPA decisions by providing a framework for discussion and for public understanding of the factors that enter the decision process. The analyses would make possible the generation and evaluation of a more complete set of regulatory alternatives. Routine consideration of potential problems of implementing regulations and standards would help assure the practicality of EPA decisions. The careful consideration of uncertainties in available information and in the analyses would be useful both in directing the Agency's research efforts toward the resolution of those problems that appear to be particularly critical for decisions and in enhancing the credibility of EPA decisions. Even where existing legislation limits EPA's freedom to choose alternatives or consider certain factors, the Agency should assume responsibility for examining the consequences of various courses of action and making the analytic results available to the public.

* * *

The regulatory decisions EPA makes are difficult and often controversial and involve a variety of scientific, technological, legal, political, economic, and social considerations. Yet, despite the apparent logic of carefully identifying and evaluating the consequences of its actions, EPA has not regularly applied explicit analyses of the sort recommended here. The Agency's failure to do so may be attributed to a number of factors: the state of technical knowledge about environmental pollution and its consequences is, in many cases, uncertain and incomplete; existing legislation constrains or prohibits the consideration of certain factors in the decision process; the sense of urgency that pervaded the Agency in its early years made systematic analysis seem a luxury that was accorded low priority; explicitness carries with it certain political risks for the decision maker, particularly when the decision is based upon difficult value judgments or when the information base is incomplete.

The recommendation is, in essence, an endorsement of well-recognized principles of rational decision making. Systematic application of these principles to EPA decisions could help assure the examination of all relevant considerations, encourage the identification and evaluation of alternative courses of action that might otherwise be ignored or prematurely rejected, and clarify for the public and Congress the rationale for decisions. The end result would be better, more credible decisions.

It should be recognized that the systematic analysis suggested here is not a means of making decisions mechanically. It is a tool that would provide a decision maker a clearer understanding of the alternatives that must be considered and their consequences. It can make areas of agreement and disagreement more apparent and focus discussion on real problems. It can identify critical issues and can indicate potentially rewarding directions for research. Ultimately, however, decisions involve subjective judgments for which no amount of analysis can substitute.

Clearly, analyses of the sort discussed here can vary greatly in elaborateness and detail. A sophisticated analytical treatment of environmental decisions can be a difficult and time-consuming task, and should be reserved for only those decisions with potentially great impact and that need not be made immediately. (Appendix D discusses some of the problems that might be encountered in performing a comprehensive analysis. An example of the use of such an analysis and the difficulties involved in its performance can be found in a review of control techniques for stationary sources of air pollution carried out by the National Research Council [1975].) But for all decisions, a careful specification of objectives, a statement of the alternatives considered, an identification and evaluation of the consequences of the alternatives, and a statement of the uncertainties in the information and its use can and should be supplied.

Some degree of quantification is useful and natural in the analysis; often it would not be difficult to achieve, and it should be attempted wherever practical. But where quantification is difficult or impossible or would serve only to mislead by making uncertain results appear precise (for instance in describing aesthetic effects), an explicit qualitative statement of the consequences of alternatives could prove valuable to the decision maker. One need not answer all questions at the frontiers of the theory of benefit–cost analysis or decision analysis to make the careful consideration of the consequences of alternatives a useful exercise. That is to say, one need not resolve the debate over how best to set discount rates, or how to place values on apparently intangible effects, in order to provide the decision maker with a clear description of the rate at which various benefits will accrue, or at which costs will accumulate, or with a description of the effects upon aesthetics or health or human life.

Because they make clear what is not known, systematic and explicit analyses could be misused as an excuse for delay or inaction. But delay is not an inevitable consequence of careful analysis. Often analysis will point to preferred alternatives, will make clear the costs of delay, or may establish that improving the technical information base will have little or no effect upon the decision in question. In any case, the analysis should take no longer than the steps EPA now takes in reaching a decision.

THE ELEMENTS OF ANALYSIS: OBJECTIVES AND ALTERNATIVES

Often, in the course of the debate over decisions, people lose sight of the specific objectives or goals of a decision. Many EPA decisions have more than one objective (such as reducing detrimental health effects and preserving the natural environment), and alternative actions will achieve them to differing extents. To facilitate the identification of alternative actions and to enable a reasoned evaluation of the anticipated effects of possible EPA actions, the objectives must be carefully specified.

Having specified the objectives, the analysis should then identify or generate a set of realistic alternative actions, regulations, or standards that are to be evaluated. It should be noted that the alternatives may be as distinct as a yes or no determination about granting a suspension of standards, as in several automobile emission decisions that EPA has made, or as continuous as the level at which a standard or guideline should be set. The development of alternative actions is complicated by the fact that EPA is seldom in a position to predict the precise level of pollution abatement that will result from the imposition of a given standard or regulation. Such predictions are difficult because of uncertainties in the available technical information about the performance of control devices and techniques and in current techniques for relating emission reductions to improvements in ambient environmental quality. In addition, EPA decisions are not always implemented fully or in the manner predicted. Since state governments are often responsible for the administration of EPA's regulations, the Agency has little direct control over the way in which its decisions are put into practice. A high degree of uncertainty about the effects of any given alternative is, in itself, an argument for deliberately considering a number of alternatives, and if obvious, or apparently obvious, possibilities are ruled out at the start of the decision-making process, the reasons for their exclusion should be made evident.

Decisions about environmental protection often entail hard choices between apparently conflicting objectives. Some policies, for instance, protect the environment at the expense of the consumers and producers of goods; others benefit one aspect of environmental quality at the expense of another. Hence, the development of alternative policies often calls for considerable skill and ingenuity. Generating alternatives is a dynamic process; in some cases the most feasible alternatives will become clear only after data relevant to the decision have been collected and analyzed. For this reason, the generation and analysis of alternatives should be an ongoing process rather than ending in the early phases of decision making.

THE ELEMENTS OF ANALYSIS: CONSEQUENCES

The consequences of pursuing each of the alternatives should be determined and described. One would like to determine how well the various alternatives under consideration perform with respect to the objectives of the decision. Usually this can be done most conveniently in terms of the benefits and costs of the alternatives. Although this seems straightforward, a number of practical difficulties are involved in the specification of beneficial and adverse effects. The technical state of knowledge may be insufficient to provide convincing links between changes in technology and emissions of pollutants; between emissions of pollutants and changes in ambient environmental quality; or between changes in environmental quality and effects upon people, animals, plants, and materials.

An illustration of the difficulty of defining consequences is provided by an evaluation of air pollution control strategies.[1] The basic analysis rests on the determination of the effect of various technologies upon emissions of air pollutants; the effect of changes in emission levels upon ambient air quality; and the effect of changes in air quality on people, vegetation, and materials. An understanding of the state of technology and its reliability and effectiveness, detailed analysis of atmospheric chemistry and transport processes, and consideration of what may be very subtle biochemical relationships that characterize the impact of air pollution on man are necessary. Unfortunately, existing data do not permit clear and unambiguous determination of cause-and-effect relationships. There are also difficulties in accurately evaluating the costs of new or proposed technologies for pollution control that involve projections based upon uncertain or unavailable information. (Chapter 3 of this report discusses a number of issues involving the acquisition of information for decision making.)

For EPA actions, benefits are typically associated with improvement in public health or enhancement of environmental quality; actual or anticipated benefits can be related to the already stated objectives. There may, at the same time, be desirable consequences (such as energy savings or improved balance of trade) that are not directly related to EPA's mission. To the extent possible, these consequences should be included in the analysis of benefits.

Among the adverse effects of environmental actions, there are some that cannot be expressed simply as a net decrease in economic output available for all purposes other than implementing the proposed action (the economist's definition of "cost"). There may be undesired environmental, economic, or social effects (such as adverse effects on land use),

[1] Howard, R.A., J.E. Matheson, and D.W. North (1976) Decision Analysis for Environmental Protection Decisions; prepared for the Committee on Environmental Decision Making.

or types of economic effects whose value cannot be adequately expressed by the standard definition of costs (such as energy consumption or local unemployment). All such costs should be taken into account and clearly defined. Some EPA decisions fail to consider all of the potential adverse effects. Others attempt to estimate many economic impacts but fail to provide sufficient information to allow a determination of economic costs in even their narrowest sense. For example, many of the effluent guidelines for water pollutants estimate an enormous variety of economic impacts such as plant closings, price increases, and changes in the capacity of an industry but omit operating, maintenance, and other expenses from their estimates of economic costs. (For a more complete discussion of cost concepts see Appendix D.)

In addition, seldom do all of the benefits and costs of an action accrue to the same individuals or groups. Although some issues involved in the proper handling of distributional effects in benefit–cost and decision analyses are as yet unresolved (see Appendix D), at a minimum there should be an attempt to determine who receives the benefits and who pays the cost of any action.

Further, the consequences of various alternatives may occur at different times. Usually present benefits are considered more valuable than the same benefits in the future, and future costs are usually preferred to the same costs incurred at present. Therefore, analysis of consequences over time can entail such difficult judgments as assessing the importance of environmental conditions to future generations and evaluating the relative importance of environmental and economic consequences spread over decades. These judgments are difficult (see Appendix D), although a decision maker will quite likely gain considerable insight, without requiring resolution of thorny technical issues, from a description of how benefits and costs accrue over time.

Frequently, in the analysis of the consequences of alternative policies, there is an attempt to convert all measures of benefits and costs into a single, often monetary, unit. The decision maker is thereby presented with a description of benefits and costs that enables the net effects of an action to be described in a single figure. Expressing effects in a single unit may enhance consistency among decisions by enabling decision makers to place the same value on identical effects in different decisions.

There are, however, serious drawbacks to expressing all benefits and costs in the same unit. The results of such an exercise are highly dependent upon the way the conversion is carried out and on the values of the monetary equivalents chosen. Even "reasonable" estimates of the value of life, or health, or beauty can vary enormously. Numerical benefit–cost ratios can carry with them a spurious precision that no disclaimer can dispel. Perhaps more significantly, expressions of benefits and costs in monetary terms assume that it is meaningful to convert lives, health, and other consequences of decisions to dollars, an assumption that many are unwilling to accept.

In preparing analyses of the consequences of environmental decisions, it is not necessary to express all benefits and all costs in the same units. A description of the expected consequences in terms appropriate to the particular instance (that is, lives saved expressed as lives of life-years, capital costs as dollars) will, in itself, be useful. In those cases in which they are calculated, net benefits or benefit–cost ratios should be recognized as no more than numerical artifacts. Their sensitivity to the value judgments made in assigning monetary value to effects should be made clear and the numbers should not be accorded any more weight in decision making than would the monetary equivalents on which they are based.

A direct comparison of the benefits and costs of an EPA action will often be difficult since the benefits and costs may not be expressed in similar units. One frequently useful method, called cost–effectiveness analysis, is to compare the monetary costs of those alternatives that have roughly the same effects on environmental conditions and other objectives. The least costly of such alternatives will generally be preferred. A closely related approach involves maximizing achievements with respect to specific environmental goals within a fixed budget. This approach is relevant for EPA programs such as construction grants for publicly owned sewage treatment plants. (A more complete discussion of cost–effectiveness analysis is found in Appendix D.) Even a minimal analysis of alternative courses of action should include some form of cost–effectiveness analysis.

Evaluation of proposed Agency actions should always take account of the incremental benefits and costs of moving from one alternative to another. Consideration of these differential effects recognizes that the basis for choosing among alternatives is the difference between their effects; the average or total benefits and costs of the alternatives are not relevant for this purpose.

Cost–effectiveness and incremental analyses are most easily performed when there is a single predominant objective. When more than one objective is desired, as is almost always the case for environmental problems, the analysis can still be completed; however, there may be gains in one objective and losses in others when moving from one alternative to another. While this complication generally makes the ultimate decision more subjective, the analysis is important in these cases because it can reveal the differences in consequences attending various alternatives.

In evaluating the consequences of decisions, it is particularly important to consider the practical and bureaucratic difficulties in implementing or enforcing the decisions. Chapter 2, Section B of this report discusses the problems of implementation in some detail; suffice it to say here that ease or difficulty of implementation should be an integral part of the analysis of alternatives.

THE ELEMENTS OF ANALYSIS: UNCERTAINTY

The environmental and economic consequences of a regulatory decision are generally uncertain because of our limited understanding of the complex physical, biological, and economic systems involved. Typically, an environmental protection decision is pervaded by uncertainties about the abundance and distribution of man-made and naturally occurring chemicals; about transformations from one chemical form to another; about the toxicity of chemicals to man or other organisms; about the effectiveness and costs of clean-up and control procedures; and about the other economic and ecological consequences of environmental management programs.

EPA recognizes and handles uncertainty in several ways. In some cases, ranges are presented for information or projections. In others, EPA presents specific results with qualifying statements such as, "these results are highly uncertain." In extreme cases, EPA deals with uncertainty by simply refusing to quantify specific items on the grounds that quantification is not possible.

Since in most instances some action must be taken, experts should convey whatever information they have to decision makers and others. Little is gained by introducing such equivocal language as, "rarely", "unlikely", "seldom", "quite a few", "not so many". It is worth the effort to be precise about degrees of imprecision. Often it is possible to express the state of knowledge by using probabilistic evaluations based upon models, empirical data, and expert testimony. Where precision is impossible, warning should be given to place results in perspective and to convey how numbers were chosen and how uncertain they are by giving ranges and best estimates.

Being explicit about the uncertainties involved in decision making is not without its problems. Clear statements about a lack of precise knowledge can make decisions more susceptible to attack by various interested parties. Nevertheless, although clarity invites criticism, so too does unnecessary vagueness or imprecision.

IMPLEMENTING EXPLICIT ANALYSES AT EPA

As noted earlier, analyses in support of EPA decisions, while including the elements discussed above, can vary greatly in elaborateness. Such features as the number of alternatives examined, the detail with which uncertainty is analyzed, and the extent to which the analyses evaluate nonmonetary and distributional effects can all vary according to the importance and complexity of the decision. However, at a minimum, each of the elements treated in preceding sections should be included by EPA in all of its regulatory decisions. In addition, EPA should undertake more ambitious analyses of selected decisions. The selection of these decisions should be made on the basis of estimates of their potential impacts as well as the amount of time available before the decision must be made (see Chapter 3, Section F, Statutory Deadlines on Administrative Actions).

Real and perceived legislative and legal constraints have inhibited the use of more explicit and systematic analyses at EPA. Both the Clean Air Act and the Water Pollution Control Act contain provisions that prevent consideration of important types of benefits and costs. For example, national ambient air quality standards are to be set solely on the basis of health effects and the law does not call for any consideration of the costs of meeting the standards. In some cases, the law itself actually sets standards. For instance, the Clean Air Amendments of 1970 actually specify the degree of pollution reduction required for automobile emissions. However, notwithstanding these legislative mandates, EPA is often encouraged by Congress and the courts to consider a broad range of possible consequences in evaluating alternatives. (Thus in its decision in the case of *International Harvester Co.* v. *Ruckelshaus* [1973], the Court of Appeals for the District of Columbia urged EPA to give more consideration to potential economic costs of an incorrect decision to deny an application for suspension of automobile emission standards; the broadened consideration of effects ultimately led EPA to reverse its decision.)

In some cases where the legislation leaves EPA relatively unconstrained, as in the case of pesticide control, the Agency has started to apply more systematic methods of analysis. In general, EPA is moving toward a more systematic consideration of the environmental benefits and social costs of control of carcinogenic substances in the environment. But these areas are important exceptions and are not yet the rule for EPA programs.

Before EPA can adopt more complete and explicit analyses over a wider range of its environmental decisions, the Agency will have to clarify its procedures, provide for internal review to assure that the minimum requirements of explicit analysis are met, and insure that all program offices have personnel adequate to carry out the necessary tasks. One way to accomplish these objectives would be to expand the role already provided for EPA's Office of Planning and Management. Specifically, this office could be responsible for:

a. Designing procedures that would result in the systematic and consistent use of explicit analysis in evaluating all regulatory decisions. To this end a set of standard definitions of benefits and costs could be promulgated. (Divergence from the standard definitions would be allowed only when necessary.)

b. Assigning analysts to working groups to aid in structuring problems in a manner that would insure consideration of the basic elements of analysis and determine whether exceptions to general procedures and definitions were warranted.

c. Emphasizing the need for retrospective analyses in the review of past decisions to provide information about the accuracy and quality of past methods of evaluation and of data for more accurate assessments of implementation costs. (See the discussion of organizational feedback in Chapter 5, Section L.)

The Office of Planning and Management as well as other parts of EPA already have some personnel capable of conducting comprehensive analyses, but the widespread implementation of such analyses will come about only through encouragement from the highest level in the Agency. All offices responsible for developing regulations and alternative policies should have personnel with the necessary analytical capabilities. The Office of Planning and Management cannot be expected to bear sole responsibility for the implementation of complete and explicit policy analyses if specific program offices are uncooperative or incapable of carrying them out.

The case studies performed for this Committee (see Appendix E) indicate that, in many cases, much of the information needed to perform at least a minimal analysis is available at the time a decision is made.

Often it is hard to find, buried within reports or technical papers, but careful information gathering, as opposed to extensive new research projects, is often all that is necessary to make the information available to analysts. The analyses themselves may suggest areas in which more research could provide data and information that would be particularly useful for decision makers and that may also be valuable in guiding the Agency's research program.

Much is yet to be learned about techniques for improving comprehensive analyses of environmental decisions. To this end, EPA, working closely with the outside analytical community, should undertake to develop and improve the state-of-the-art of analysis for environmental decisions. More research is needed, particularly on (a) techniques for incorporating estimates of the effects of changes in ambient conditions on environmental objectives (for example, improvements in health); (b) methods for judging, expressing, and comparing the social importance of nonmonetary benefits such as reductions in mortality rates and increases in environmental amenities; (c) principles to be used in evaluating benefits and costs that accrue at different dates; and (d) approaches for estimating ranges of uncertainty and for incorporating the costs of the inevitable residue of uncertainty in any decision.

In summary, explicit analyses could provide a conceptual framework for organization of the information necessary for a decision and for rigorous consideration of the important issues. Effort devoted to the analysis of irrelevant and peripheral information could be avoided, and the work of EPA staff and interested parties could be focused on the main issues on which the decision depended.

The use of more explicit analyses would also allow EPA to produce more defensible regulations. Systematic, comprehensive analyses can play an important role in assuring the courts that EPA has considered the full range of factors required by a particular piece of environmental legislation. (See Chapter 4, Section I for a discussion of the role of judicial review in EPA decision making.)

Public availability of the analyses would permit interested individuals and groups to understand the basis for EPA's decisions. In Chapter 4, Section G of this report it is recommended that a record be maintained for each decision, and that a document be prepared describing the information and analysis used to make the decision. The record should include the full analysis; the decision document should include a discussion of the elements of any analysis that EPA has performed in support of its decision making.

This report does not quantify the benefits of implementing more systematic and comprehensive analyses at EPA. However, there are indications that they are large and some practical experience can be cited. For some decades now, the Corps of Engineers and the Bureau of Reclamation have been preparing quantitative analyses of their proposed undertakings. These evaluations are always imperfect and results are frequently overriden because of political or other considerations. Nevertheless many poor projects have been rejected as a result of these analyses, and the designs of many others have improved. Thus the requirement of these explicit, quantitative analyses has not induced mere lip service, as some skeptics originally expected. Rather, it has led to increasingly careful and thoughtful evaluations that have improved appraisals of programs as well as the quality of project designs. There is every reason to expect that the introduction of systematic, comprehensive analyses to decision making at EPA would have similar results—not an abrupt, overnight reform, but a gradual increase in the analytical capability of the Agency and an eventual improvement in quality of decisions.

B. BARRIERS TO THE IMPLEMENTATION OF EPA REGULATIONS

Many EPA regulations are implemented by heterogeneous and relatively autonomous federal, state, and local government entities that have limited resources and varied incentives and constraints. Current EPA decision-making practices entail inadequate efforts to routinely consider the practicality of implementation by these different government entities. The failure to account for barriers to implementation can result in effects different from those intended when a regulation is published.

- *EPA should systematically take account of the difficulties of translating its rules into environmental action at the local level. The assessment of resource constraints and of other qualitative barriers to implementation should be an important concern in the formulation of new EPA regulations.*

For regulatory policies that entail activity by authorities outside headquarters, EPA should determine whether the full range of federal, state, and local government resources required for implementation are available, and when they are not, the Agency should either adopt an alternative policy with more realistic resource requirements or redeploy resources to meet anticipated needs or both. EPA can use program grants to states and localities for this purpose.

Those responsible for developing new regulations should also assess other qualitative impediments to implementation by states and localities. To help assure sensitivity to these practical considerations, EPA should routinely prepare a summary declaration of implementation prospects for new regulations, covering such factors as conflicting organizational interests, lack of adequate information on performance by dischargers, and inappropriate incentives and disincentives for regulated entities, and the Agency should make this analysis available for critical review and comment by field authorities.

* * *

THE IMPLEMENTATION PROBLEM

There is considerable feeling in EPA regional offices and in state and local governments that officials at EPA headquarters are too often oblivious to the practical difficulties of implementing EPA regulations. Pollution control officials with responsibility for implementation complain that their programs are continually subjected to new directives and deadlines, although their resources are already overextended, and that new EPA regulations show too little sensitivity to local needs and capabilities.

Some such dissatisfaction is inherent in any large organization, and in the case of EPA it was accentuated by the hurried assembly of broad and unprecedented national programs mandated by ambitious pollution control statutes. There are three reasons, however, for not dismissing these concerns as a minor annoyance. First, because environment programs are decentralized, EPA often lacks direct control over the way regulations are actually applied to dischargers, and there is a need to compensate by analyzing implementation barriers more thoroughly when a new rule is developed. Second, these barriers have proven an important cause of slippage in the attainment of environmental goals. For example, resource limitations have seriously hampered the issuance of water discharge permits and thus have helped to thwart the attainment of 1977 water effluent goals for industrial sources. Third, most of the major pollution control programs are now in place, and the many government institutions charged to administer these programs are becoming mature and stable. The time is right for a deliberate shift in emphasis from program design to improvement of the linkage between intended and actual consequences.

RESOURCE CONSTRAINTS

The implementation of EPA regulations is dominated by a fundamental aspect of the national system for environmental protection: administrative resources are severely restricted relative to the magnitude and complexity of the nation's pollution control problems. The 10 EPA regional offices have an aggregate staff of fewer than 4000 employees, meaning that as many people are employed by both the Census Bureau and the Small Business Administration as are working in the federal effort to implement environmental regulations. Combining this force with the environmental personnel of the states still leaves the total enterprise somewhat short of USDA's Forest Service or the FBI in a number of permanent positions. The average annual outlay per state for air and water pollution control is about $6 million, including some $2 million in federal program grants. Spread across the entire range of environmental programs, available resources can become extremely thin; for instance, the State of Colorado, which has accepted delegation of the water permit program, has had only four engineers to write more than 1100 permits, and only seven professionals for sampling and compliance monitoring.[2] EPA calculates that even by 1980 state air pollution control programs will reach only 75 percent of the resource levels called for in state implementation plans (U.S. EPA 1975:8-9). While the nation's pollution control budget is still growing, there is no promise of dramatic relief from this severe resource constraint at the local, state, or federal levels.

Officials in state organizations and EPA regional offices are critical of EPA headquarters for writing regulations that require more field resources than are available. It might seem that EPA has missed an opportunity to alleviate resource shortages by its practice of approving delegation of authority to undermanned state agencies in the hope, rather than on the condition, that a state will later augment its staff. On the other hand, given the sense of urgency surrounding the national environmental program and the fact that the alternative to a small delegated state pollution control effort was an even smaller EPA effort, the Agency's actual freedom to stipulate larger state organizations as a condition for delegation has been limited. It may be true that Congress has contributed to this administrative overload by assigning EPA a

[2] Price, V.S. (1976) State and EPA Regional Implementation of Pollution Controls, Appendix III, page 6; prepared for the Committee on Environmental Decision Making.

mission larger than its budget, but sound decision making requires that this practical constraint be taken into account, even if it confines EPA to choices among imperfect but achievable regulatory options.

The resource shortage also has features that improved funding alone would not correct. States vary, for example, in their ability to attract competent and dedicated public servants, and the needed environmental expertise to support environmental programs is not ubiquitous. In many cases, time itself is a scarce resource, as when complex accomplishments are required quickly to meet a statutory deadline or when the implementation of one regulation is dependent on another.

QUALITATIVE CONSTRAINTS

Criticism of EPA's neglect of practical constraints is not limited to the question of administrative resources. Several other qualitative factors can divert written rules from their intended effect by the time they are applied in the field. Many feel that EPA regulations embody naive assumptions about the significance of such problems as:

Conflicting Organizational Interests Often those who implement environmental regulations are reluctant to perform prescribed functions because they conflict with or are of lesser priority than those dictated by their own organizational and political interests. For instance, state political leaders were reluctant to write and enforce transportation plans as originally required under the Clean Air Act because of popular resistance to transportation controls. At least initially, many in EPA headquarters failed to anticipate this reaction. Similarly, EPA's handling of Section 208 of the Federal Water Pollution Control Act has shown inadequate appreciation of the extent of program competition between state water pollution control agencies and substate agencies conducting comprehensive waste planning.

Ineffective Incentives Implicit in the strategy chosen for the implementation of new rules are notions of how pollution control authorities and dischargers can be induced to take desired actions. Perverse incentives can result if an assumption about inducements is erroneous. Inappropriate incentives can also result when a regulation is written to account for worst case conditions for implementation. For instance, if a nationwide delay in the effective date of a standard is granted to allow weaker states to develop their programs, there is little incentive for further improvement of strong state programs, and the delays may even undermine the accomplishments of those stronger programs; similarly, regulations written to assure compliance by recalcitrant dischargers may provide little incentive for prompt action by more cooperative ones. In addition, state pollution control authorities and regulated firms may react to specific standards or guidelines for enforcement keyed to existing technologies by neglecting fresh approaches and innovative developments in control techniques. For example, a discharger may not install or a state may not approve trial use of unproven alternative control devices, and pesticide manufacturers may be discouraged from developing potentially safer new pesticides by the expense of meeting EPA registration requirements.

Inadequate Communications While it is often difficult to separate communication difficulties from disagreements over substance, some implementation failures are caused by lack of clarity and accuracy in the transmission of regulatory directives (and their rationales) to field personnel and in the reverse flow of information on implementation prospects to EPA headquarters. This is a particular problem in decentralized organizations like EPA where regional offices are layered between headquarters and state/local authorities who play significant roles in implementation.

Lack of Adequate Information on Performance Environmental regulations sometimes cannot be implemented effectively because information necessary for enforcement action is simply unavailable. Enforcement ultimately depends on the capability of implementing agencies to conduct monitoring and surveillance. Resource limitations exacerbate this problem because federal and state agencies, lacking personnel to do more than conduct spot checks, must rely largely upon reports from the dischargers themselves, the accuracy of which depends to some degree on the credibility of sanctions against submitting unreliable data. Technical complications also exist. For example, the program for implementing control of nitrogens has been stalled by technical problems in monitoring. Some compliance tests are extremely expensive and so unreliable that they are difficult to sustain in court.

CURRENT EPA PRACTICE

EPA has taken initial steps to solve both aspects of the implementation problem by encouraging implementing authorities to participate in the development of standards and regulations. Primary staff responsibility for policy coordination between EPA headquarters and the regional offices and states lies with the Office of Regional and Intergovernmental

Operations (ORIO), located in the Office of the EPA Administrator. ORIO has a staff of seven and an annual budget of less than $500,000. The office has several formal rule-making tasks, including early review of the working groups' plans for external participation in order to augment state officials' opportunities to participate in the development of new regulations that will affect their programs. ORIO coordinates the mandatory distribution of EPA regulations to the Advisory Commission on Intergovernmental Relations (ACIR) for review (U.S. Office of Management and Budget [OMB] 1971). Unfortunately, ACIR reviews have rarely provided timely or useful comments. ORIO also arranges appropriate regional office involvement in rule making. For the past year, ORIO has coordinated a "lead region" concept, under which a regional official is selected to serve on the working group to assure that EPA field perspectives are taken into account early in the decision-making process.

In addition, the Agency's manual for rule-making procedures (U.S. EPA 1977) directs working groups to prepare an assessment of the impact of regulations on EPA's own resources. This analysis is to be prepared with consultation and review by the Office of Resource Management within the Office of Planning and Management. (A brief account of actual rule-making procedures is presented in Appendix C.)

ASSESSMENT AND RECOMMENDATIONS

Resource Impacts

Current EPA practice leaves room for improvement. Our review of EPA regulations indicates that the prescribed resource impact assessment is missing from available documentation for about half of the Agency's regulations, and that most of the assessments that do appear are sparse statements that the immediate impact on EPA manpower requirements will be negligible. The analysis is rarely more than superficial, and generally considers only whether new EPA positions will have to be established, for the Office of Resource Management's primary interest in the review procedure has been to ascertain that the following year's budget plan is consistent with the new draft regulation. Subjective estimations of the implication of can be provided for a working group by "lead region" representatives (providing the subject arises in working group sessions), but these officials are typically technical specialists largely unfamiliar with the details of administrative resource needs. ORIO itself lacks the analytic capacity necessary for thorough review of the accuracy of resource assessments.

As a result, there is only rarely a careful investigation of a regulation's immediate implications for EPA personnel levels, and almost never any formal attention either to the other impacts on EPA resources (equipment, time, expertise, or future budget ramifications) or to *any* of the resource implications for state and local implementing authorities.

The role of the resource assessment should be upgraded in the writing of EPA rules. Working groups should be required to prepare more extensive analyses of resource requirements for EPA and for state and local agencies, and then to compare the estimated requirements with what is currently available. The several varieties of scarce resources should be covered in this assessment. When resource gaps are identified, several responses may be appropriate: development of new regulatory options that are less demanding of resources for their implementation; adjustment of relative priorities and timing of other regulatory programs; or redeployment of EPA's own resources, and, through program grants, selective augmentation of state and local resources. This type of assessment may entail a substantial initial effort to ascertain current resource levels.

Qualitative Barriers

It is clear that many past EPA decisions have faltered at the implementation stage because of qualitative factors distinct from resource limitations, and that these other factors have rarely been treated analytically in formulating new regulations. The solution to this problem is far less clear, and may require a number of independent measures. The general objective is to place a burden on EPA working groups to show that they have carefully attempted to account for foreseeable implementation barriers. In this area, as in many others treated in this report, the best single solution is Agency leadership that gives appropriate emphasis to implementation and that insists that EPA regulations show sensitivity to actual field conditions.

The steps that EPA has taken to promote working group participation by regional officials with implementation responsibilities are significant improvements and must be continued and reinforced. One area for further improvement is direct participation by representatives of state and local environmental agencies. The practice of including state officials on working groups was significant in the development and implementation of safe drinking water regulations. This measure has had two virtues: it has acquainted headquarters officials with potential implementation pitfalls and has also improved prospects for cooperation by state programs. Such practice should be continued when EPA is developing regulations with significant impact on state resources and when EPA is given unambiguous legislative guidance as to minimum program requirements. Otherwise preferences of some states for less stringent controls than Congress intended may prevail when EPA regulations are developed.

Even fully implemented, however, state and local participation must be augmented by measures to assure that the working group's assumptions about practical field consequences are explicit. Requiring a brief but routine declaration of implementation prospects is one device that would help assure forethought, and would also allow review by implementing authorities to prevent EPA from using inaccurate assumptions. This headquarters assessment should summarize the most difficult of the expected problems of implementation, not excluding those cited by implementing officials themselves. The declaration should be analytic in character; its empirical base should not be limited to informed opinion about possible implementation barriers, but should include such information as the relevant experience of analogous past regulations. For anticipated problems that are amenable to direct EPA control, a short statement of remedial actions should also be released.

There are good reasons, of course, for excluding discussion of certain kinds of barriers from this account; staff morale and delicate interagency relationship, for example, are not likely to be strengthened by the appearance of an official summary on suspected deficiencies, and an explicit statement could in a few cases convert potential obstacles into certain roadblocks. Such dangers, however, should not be allowed to deter EPA altogether from careful and systematic consideration of programmatic uncertainties affecting implementation.

Other measures also deserve fresh attention, including the strengthening of incentives for personnel rotation between field and headquarters. Interaction between the working group and personnel in the proposed implementation studies program (see Chapter 5, Section L) will be fruitful in applying the lessons of past programs' relative success. Transferring resources to ORIO to create new analytic capability is also a possibility, although it would reverse ORIO's present determination to remain a lean staff office. EPA may well have to fashion new administrative methods to attain the necessary improvement, and should freely experiment with new approaches to identify better solutions in this crucial area.

REFERENCES

International Harvester Co. v. *Ruckelshaus* (1973) 478 F 2d 615 (D.C. Cir.).

National Research Council (1975) Air Quality and Stationary Source Emission Control. A Report by the Commission on Natural Resources, National Research Council, National

Academy of Sciences, National Academy of Engineering, for the Committee on Public Works, U.S. Congress, Senate. Committee Serial No. 94-4, 94th Congress, 1st Session.

U.S. Environmental Protection Agency (1975) State Air Pollution Implementation Plan. Progress Report. Office of Air Quality Planning and Standards, EPA/450/2-75-008. Research Triangle Park, N.C.: U.S. Environmental Protection Agency; PB-247 682/8BE. Springfield, Va.: National Technical Information Service.

U.S. Environmental Protection Agency (1977) Development of Regulations. Draft. Office of Planning and Evaluation. Washington, D.C.: U.S. Environmental Protection Agency.

U.S. Office of Management and Budget (1971) Consultation With Heads of State and Local Governments in Development of Federal Regulations. Circular A-85. Washington, D.C.: U.S. Office of Management and Budget.

3 Information and Analysis for Decision Making

C. ADVICE AND REVIEW FROM SCIENTISTS AND ENGINEERS OUTSIDE EPA

EPA often relies on previously unpublished or unreviewed data; this places a special burden on the Agency to make certain that the scientific and technical basis for its decisions is accurate and reliable. In addition, EPA does not have a regular and effective channel for advice to the Administrator from outside scientists and engineers, with the result that independent scientific judgments have not always been provided to the Administrator.

- *Scientific and technical data and analyses used in decision making should be reviewed routinely at an early stage to assure that all relevant data are considered and to reduce the possibility of misinterpretation or misuse of scientific results. In this process EPA will be greatly aided by the wide range of scientific and engineering expertise that exists outside the Agency. The reviews should be available to the public as a matter of course.*
- *On decisions that set significant precedents or have a substantial impact on public health or welfare or on public or private expenditures, the*

Administrator personally should have access to independent scientific advice and evaluations of the overall technical basis for decisions.

This can best be accomplished by increasing the responsibilities of the existing Science Advisory Board (SAB) so that its chairman would serve full time for a fixed term and would convey independent evaluations of scientific and technical data and analyses directly to the Administrator. In addition, the Chairman of SAB should have explicit authority to initiate SAB activity on issues for which he or she judges scientific and technical advice to be warranted.

* * *

Proper use and interpretation of scientific and technical information in the development of standards and regulations and in other decisions central to EPA's regulatory responsibilities require the efforts of a large number of competent scientists and engineers within the Agency.[1] The complexity of environmental problems and the diversity of the fields of knowledge upon which environmental decisions depend necessitate, in addition, review and advice from outside scientists and engineers.

The current procedures used by EPA to develop and promulgate standards and regulations provide for review of the scientific data and analysis by interested groups both within and outside the Agency (see Appendix C for a description of these procedures). The publication of much of the scientific and technical data and many of the methods of analysis in scientific and technical journals provides an additional source of review.

Overall assessments that gather and integrate data and analysis from many sources to identify the state of knowledge pertinent to a particular EPA decision have been prepared and reviewed effectively, though not routinely, under auspices of the Agency's Science Advisory Board. (SAB is made up of outside experts who serve without salary. A brief description of SAB and its structure is given in Appendix B.) To date SAB has examined a range of issues, including: the health effects and chemistry of the sulfur oxides/particulates complex in air; the health risk from organic chemicals in drinking water; the design, methods, and conclusions of the Community Health and Environmental Surveillance System (used to study the health effects of air pollution); and the value and utility of the Strategic Environmental Assessment System (intended to provide a systematic means of generating 10- to 15-year projections of environmental residuals).

---

[1] As of February 14, 1976, EPA employed 4328 scientists and engineers as full-time permanent government service (GS) employees. They were classified according to one of the following occupational categories: biological science, engineering, mathematics, medical science, physical science, or social science. Based on the same categories for the same period of time, but possibly including other than full-time permanent employees, the number of scientists and engineers in the Office of Research and Development in government service was 1094 or 25 percent. In addition, 112 scientists and engineers were public health service officers serving in the Office of Research and Development.

According to a separate categorization scheme, as of March 13, 1976 covering all full-time, white collar employees at EPA, the total number of employees was 10,277, of which 4828 or 47 percent were scientists and engineers. Thus, almost half of all white-collar employees at EPA are scientists and engineers, and about one-quarter of them are in the Office of Research and Development.

Despite the ongoing review program at EPA, there have been a number of instances in which the adequacy of the scientific and technical basis for standards, regulations, or programs could have been improved by additional review by scientists and engineers inside or outside EPA. Among these are effluent guidelines for certain industrial categories (such as the manufacture of organic chemicals), the uniform requirement of chlorination for publicly owned waste treatment facilities, and the regulation of lead as an air pollutant.

The scientific and technical aspects of many of the decisions, while not necessarily the determining factors, have been critically important. Technical review can help assure that decisions with far-reaching consequences are as soundly based as current knowledge allows.

ADVANTAGES OF OUTSIDE REVIEW

Technical review, as conceived here, entails critical evaluation of the scientific and technical information and analysis used in decision making by an individual or group with direct interest in the outcome of the decision and competent to determine whether the information was properly gathered or used.

Independent experts competent to review data and analysis used in decision making may be difficult to identify, particularly since many experts are employed by or consult for the industry to be regulated.

If the scientific and technical information used as the basis for a regulatory decision has been published, it will generally have been subjected to extensive review prior to publication and to comment by a wide community of experts after publication. But in those situations in which review has not occurred, it should be undertaken.

Review of scientific and technical findings is a standard practice. Articles submitted to journals and similar publications are reviewed by referees with special expertise in the areas covered by the articles. Prepublication of many articles and presentations of research findings at professional meetings constitute less formal reviews of the same type. Also, publication makes results available to a large community of experts that is generally free to be critical and to make known its views about the merits and limitations of the technical results. Peer review is also frequently used in decisions on funding for research proposals.

Besides guarding against inadvertent errors in the interpretation or consideration of relevant information, review can help to address or eliminate several other problems. Much of the process by which EPA makes regulatory decisions is adversarial, and often scientific information is provided by one of the principals. Similarly, the Agency itself is sometimes placed in an advocacy role. In either case, review can help to assure a balanced treatment of scientific and technical information used.

Even the suspicion that the information in a regulatory debate is somehow biased can pose problems for the Agency. Here again, review can lend legitimacy to the data or analysis, even if the review does not disclose any problems or lead to any changes in the data or their evaluation. By opening up the process to a broad range of interests and experts, EPA can aid in focusing debates more narrowly on regulatory issues and can help identify those instances in which value judgments are presented as matters of technical fact.

With few exceptions, reviews should be public. In what appear to be rare instances, the proper handling of proprietary information might preclude full disclosure. A critical ingredient of review is that it opens the methods of inquiry and analysis employed in decision making to scrutiny by all scientists and engineers who wish to be involved. Indeed, the compelling argument for openness in the review process is that an open review is self-correcting and serves many of the purposes of publication in the scientific literature. If data and analyses are available to the scientific and engineering community, errors and limitation in information are more likely to be recognized.

THE OUTSIDE REVIEW PROCESS

For technical reports presenting experimental results or analyses of data, the standard method of review involves simply requesting comments from known experts. SAB should develop guidelines, in cooperation with the Office of Research and Development (OR&D), for the kinds of information that would be reviewed for various types of decisions, should provide guidance and oversight of the review of data and information, and can be helpful in compiling lists from which reviewers may be chosen. The review of scientific and technical data and analysis used as a basis for decisions should be the responsibility of OR&D in conjunction with the relevant program office.

Scientific and engineering societies can aid in obtaining reviews. These organizations could be tapped by EPA as effective vehicles for obtaining the views and advice of scientists and engineers expert in relevant disciplines. Indeed, many societies now recommend distinguished individuals to serve on advisory committees, and EPA should make greater use of societies in this way.

Overall assessments might require a more elaborate procedure such as that currently employed by SAB, which convenes ad hoc committees of experts from a number of disciplines to advise the Agency. The routine use by SAB of such ad hoc rather than standing committees or study groups has provided increased flexibility by allowing experts to work on problems as they arise.

In certain cases in which scientific and engineering issues are particularly broad in scope or impact, EPA, like many other government agencies, has referred questions to the National Research Council (NRC) of the National Academy of Sciences and the National Academy of Engineering. In addition, questions are often referred to NRC by Congressional mandate. Nevertheless, the primary channel of external advice to EPA should be SAB.

EXTERNAL ASSESSMENTS AND THE ROLE OF THE SCIENCE ADVISORY BOARD

The Administrator personally should have independent advice on and evaluation of the overall technical basis for important decisions (that is, decisions that set significant precedents or have a substantial impact on public health or welfare, or on public or private expenditures). For this purpose, the responsibilities of the SAB should be expanded so that it routinely provides or reviews the technical assessments prepared for the Administrator on major decisions. This will entail modifications in the structure and operation of the Board.

The Chairman of SAB should serve as the Administrator's Science Advisor, report directly to the Administrator, and be fully independent of the Office of Research and Development. Currently, the Assistant Administrator for Research and Development serves as the Principal Science Advisor to the Administrator as well as having responsibility for most of EPA's research programs.

As Science Advisor to the Administrator, the Chairman of SAB would be insulated from the daily pressures of administering and managing the Agency's research and development program. Because SAB would be the principal channel of advice from the scientific and engineering communities, its Chairman could take a broader view of the scientific and technical aspects of decisions than could the Assistant Administrator for Research and Development who represents EPA's internal scientific effort. The independence of the Chairman is important if EPA is to continue to attract able and respected scientists and engineers to that office.

The Chairman of SAB should be given explicit responsibility for initiating involvement in issues for which scientific and technical advice is warranted. Currently, the Chairman can and does indeed bring issues to the attention of the Administrator and, at the Administrator's request, SAB investigates and reports on a problem. However, it remains possible that internal and external pressures on the Administrator may interfere with adequate evaluation of scientific and technical information. Explicit authority to initiate involvement in issues is essential to the independence of SAB and its Chairman.

The current arrangement under which the Chairman serves part-time is not adequate for the discharge of the responsibilities envisaged here, nor is it sufficient to acquire an understanding of the Agency and of the technical aspects of its broad range of decisions. By serving full-time, the Chairman of SAB would be better able to assure that the fundamental scientific and technical bases for decisions are not distorted, compromised, or lost sight of in the final, often hurried, stages of EPA decision making.

The term of office fixed for the Chairman of SAB should be short: about two years of full-time service. Under these terms, the Chairman will be less likely to become professionally identified with the past decisions of the Agency or to be subject to bureaucratic pressures within the Agency—a situation that might lead to ingrained positions and defensiveness. Moreover, prominent, active scientists and engineers would be more willing to devote a portion of their careers to the position if the term were fixed.

CONCLUSION

The Committee recognizes that these recommendations for instituting additional review procedures and for modifying the structure and operation of SAB involve the commitment of additional Agency resources. Furthermore, additional review by outside experts, if not conscientiously and carefully established, may not provide all the benefits of external review and could lead to unnecessary delay in the promulgation of standards and regulations. Nevertheless, the additional participation of scientists and engineers outside EPA is a critically important supplement to review by interested parties. It will assure that data and analysis that form the scientific and technical basis for decisions are fully and properly used and that sound independent technical assessments are made available to the Administrator.

D. DEPENDENCE ON REGULATED INDUSTRIES FOR DATA AND ANALYSIS

EPA is inevitably dependent on the industries it regulates for much of the technical and economic information it uses in decision making. The impact of many decisions on industry creates a potential conflict of interest that may cause industry, either inadvertently or intentionally, to distort or withhold necessary information. EPA is particularly dependent on industrial data for: (1) the determination of the toxic effects of substances released to the environment; and (2) the assessment of the costs and technical feasibility of pollution control devices and of engineering alternatives in production processes to achieve pollution control.

- *EPA should develop sufficient scientific and technical expertise within the Agency or through independent institutions and should institute procedures to assure the quality, reliability, relevance, and completeness of data provided by industry for EPA's use.*

EPA should extend its development and publication of guidelines and protocols to apply to all toxicological testing and should insure their use. This is particularly important now that legislation to control commercially available toxic substances has been enacted. In addition, laboratories performing toxicological tests should be certified as having acceptable facilities, personnel, and standards of performance, and EPA should eventually accept data only from certified laboratories. A program of "spot checks" of certified laboratories, and selective audits of reported results, should be undertaken to monitor the maintenance of standards for toxicological testing.

To minimize its dependence on industry for information on pollution control technology or industrial processes, EPA should use and support those few independent experts in this area currently in government laboratories, universities, and research organizations. Where independent expertise in areas central to EPA's interests and responsibilities does not exist, the Agency should develop technical programs consisting primarily of research and development activities within EPA, in other governmental laboratories, or in independent institutions so that appropriate expertise can be developed and maintained.

* * *

INFORMATION FROM REGULATED INDUSTRIES

Information used in regulatory decision making is collected from many sources, and ranges in kind and scope from the properties of individual pollutants or products to the operational and economic characteristics of point sources of pollution. EPA necessarily depends upon regulated industries for much of the scientific and technical information and analysis it uses to develop and enforce standards and regulations. Fortunately, as a rule, industry cooperates in providing EPA with information that the Agency requests.

However, the problems associated with dependence on industry for information are inherent in the conflicting interests of EPA as a regulatory agency and the industries it regulates. The situation provides a strong incentive for industry to withhold possibly damaging information or to submit inadvertently, or perhaps deliberately, biased data and analyses to be used in decision making.

The regulation of vinyl chloride as a hazardous air pollutant is an illustration of early cooperation by industry. For its regulation of vinyl chloride emissions into the environment, EPA had to evaluate sources of emissions for different types of plants involved in the manufacture and fabrication of polyvinyl chloride (PVC) from vinyl chloride gas, which is a known carcinogen, and to determine the best means of emission control. Under authority granted by the Clean Air Act, EPA asked industrial firms to supply information on the processes and practices employed by various plants. The industry, which had not been cooperative earlier in its relationship with the Occupational Safety and Health Administration in setting an occupational exposure standard, cooperated and supplied information that made possible the consideration of control technology alternatives by EPA in the development of the standard. Without early cooperation, much time and effort might have been wasted in defining reasonable and effective control options.

On the other hand, there are incidents in which information has been withheld from EPA, in which studies that might be unfavorable to industry have been poorly conducted and reported by industrial organizations, and in which industrial experts have not been candid in describing problems associated with regulation. It has been charged that problems of this type have occurred in the cases of Kepone discharge into the James River, the cancellation and suspension of aldrin and dieldrin, the suspension of automobile emission standards, and the development of certain effluent guidelines for water pollutants.

An often-mentioned impediment to the free flow of information from industry to EPA and the public is the nondisclosure of proprietary information that may be necessary for decisions. EPA is generally open in its decision making, and an industrial firm may be reluctant to provide information it feels might affect its competitive position. EPA does, however, make decisions that require detailed information concerning proprietary processes and product formulations. The reemergence of this issue in discussions of the implementation of the Toxic Substances Control Act indicates that the problem may continue to be significant for the Agency.

Even if indications of problems of EPA's dependence on industry for information were not evident, some steps to assess the information independently would still be necessary. At a time when public trust in institutions is quite low, even the appearance of possible conflicts of interest may affect public acceptance of EPA decisions, whether or not the conflicts actually affect policy.

SOME REMEDIAL ACTIONS

In many fields, EPA can hardly replicate the in-house facilities, expertise, and skills that exist in industry; at best it can get the help of consultants. But all too often consulting firms in a particular technical field are dependent for most of their business on industry, so that essentially the same potential for conflict of interest exists as in dealing with the industry directly. Thus, it is inevitable and essential that EPA continue to rely on industry for important scientific and technical information. There is no single solution to the problems of dependence on industry, but rather a series of partial solutions.

Chapter 2, Section A of this report recommends the use of more explicit analysis. Such analysis should highlight the scientific and technical information critical to the decision, much of which can be expected to have derived from industrial data and analyses. The availability of decision documents (see Chapter 4, Section G), increased public participation (see Chapter 4, Section J), technical review of scientific and technical data (Chapter 3, Section C), and review by other agencies of the federal government (see Chapter 4, Section H) all help to reduce problems of dependence on industrial data.

In addition to the general steps, there is a need for other measures in areas of particular dependence on industry, notably: (1) information used in the determination of the toxic effects of substances on human beings and the environment, and (2) information used in the assessment of the costs and technical feasibility of pollution control devices and of engineering alternatives in production processes to achieve pollution control.

DEPENDENCE ON INDUSTRY FOR TOXICOLOGICAL DATA

The problems of dependence on industry for information on toxic effects have not gone unrecognized at EPA. In testimony at a joint hearing on January 20, 1976, of the Subcommittee on Administrative Practice and Procedure of the Senate Judiciary Committee and Subcommittee on Health of the Senate Committee on Labor and Public Welfare, Deputy Administrator John R. Quarles, Jr., cited four improper situations that might exist with regard to laboratory tests submitted to EPA's Office of Pesticide Programs:

- A laboratory might be technically incompetent to perform the test because of inadequate personnel, equipment, or management experience.
- Valid test results indicating dangerous pesticide characteristics might be withheld from EPA.
- A laboratory might be so dependent upon a pesticide producer for contract work that its independent scientific judgment could be impaired by the close economic relationship.
- A laboratory might intentionally misrepresent results at the request of the manufacturer.

Measures for avoiding these problems, some of which are already used by EPA in particular instances or programs, include:

a. Stipulation of guidelines and protocols for the design and performance of tests and the reporting of results;

b. Selective auditing of results to see that such guidelines and protocols are followed and that reports are complete and accurate;

c. Certification of laboratories performing the tests as having adequate facilities, personnel, equipment, management, and reporting procedures and unannounced "spot checks" to assure maintenance of standards by certified laboratories; and

d. Identification of the individuals responsible for the generation and analysis of test data.

The measures available to the Agency differ according to whether the burden for establishing the existence of a potential hazard (and hence for developing and compiling test data) rests with the Agency (as is generally the case for pollutants covered by the relevant sections of the Clean Air Amendments of 1970 (42 USC 1857 1975) and the Federal Water Pollution Control Act Amendments of 1972 (33 USC 1251 1975) or with industrial manufacturers or processors (as is the case under the Federal Environmental Pesticides Control Act of 1972 (7 USC 135 1975), which requires the registration of pesticides based on evidence presented to the Agency of the efficacy and safety of pesticide formulations). Recent enactment of legislation to control commercially available toxic substances (The Toxic Substances Control Act of 1976 [15 USCA 2601 1976]) gives the Agency the authority to shift the burden for developing test data for substances that pollute air and water to manufacturers or processors. In those situations in which the burden is on the manufacturer or processor to show evidence of safety, the Agency can stipulate the necessary tests and the guidelines or protocols to be followed in the design and performance of the tests and in reports of the results to help assure reliable and complete information.

The Agency has promulgated proposed guidelines (U.S. EPA 1975a, 1975b) for pesticide registrations, and because of the similarity of the tests involved, these guidelines should have an impact on the test data required under authority of the Toxic Substances Control Act as well. In the course of implementation of the Toxic Substances Control Act by EPA, a large number of test guidelines and protocols will have to be developed for a wide range of effects. The promulgation of such regulations by the Agency should clarify what the Agency will accept as adequate data (which is largely the reason that the pesticide chemical industry advocated promulgation of pesticide registration guidelines) and should also help to develop relevant expertise within the Agency.[2] Others have developed useful test protocols; recent guidelines developed by the

[2] The use of stipulated guidelines and protocols is common in many EPA programs. The publication of reference methods for monitoring and analyzing pollutants in air and water and equivalent methods that may be substituted for them is a substantial portion of the Agency's research and development program. A recent example for the water program is: Environmental Protection Agency (1976) Water Programs: Guidelines establishing test procedures for the analysis of pollutants; Amendments 41 FR 52779. These test procedures are to be used by industrial dischargers to demonstrate compliance and by various enforcement agencies to verify industrial compliance.

National Cancer Institute (NCI) for carcinogenesis testing in rodents (Sontag et al. 1976) and those proposed by the Food and Drug Administration (FDA) for good laboratory practices for toxicological testing in general (U.S. FDA 1976) should prove helpful to EPA and should be adapted for EPA's purposes.

Even if protocols or guidelines are carefully established, it is necessary to ascertain whether they are being followed in practice and to determine whether data are complete and accurate. To this end, EPA has initiated a pilot program with FDA in which FDA will audit the records of toxicological tests performed at certain laboratories and submitted in support of pesticide registrations. FDA already has a program of inspection of laboratories to insure the reliability of data submitted for drug registration. The establishment of a permanent program of this type at EPA would enable the Agency to determine if protocols are followed, if errors are committed during tests, if procedures are employed that bias the results, and if reports are accurate and complete.

Laboratories should be certified as having adequate facilities, personnel, equipment, management, and reporting procedures. Although it is conceivable that EPA could manage or contract for the management of a central laboratory (or group of laboratories) that would handle all or most of the required premarket screening of chemicals, it does not now seem politically or economically feasible for EPA to do so.

EPA has given consideration to initiating a program to certify nongovernmental laboratories as having acceptable facilities, personnel, and standards of performance. The General Accounting Office (GAO) has suggested such a program in a review of EPA's pesticide registration program (U.S. GAO 1976).

Certified laboratories might be accredited by EPA, FDA, the American Association for the Accreditation of Laboratory Animal Care, or other qualified professional groups. Certification will provide at least minimal assurance that laboratories are capable of performing reliable and accurate toxicological tests. "Spot checks" of certified laboratories in conjunction with a program of selective audits of data submitted to EPA should be undertaken to assure that standards of performance and reporting are maintained. Eventually, after these programs have been in effect for an appropriate period of time, EPA should only accept toxicological data from certified laboratories.

On October 5, 1976, EPA issued an advanced notice of proposed rulemaking (U.S. EPA 1976) to solicit comments on a number of proposals intended to improve the reliability of test data submitted in the Agency's pesticide program. If adopted, the proposals would be offered as proposed amendments to regulations on the registration of pesticides

(U.S. EPA 1975b). Among the suggestions are: (a) requirements for the identification of people responsible for generation and interpretation of the data, (b) certification by an authorized officer or employee that the data are valid and complete, and (c) advanced notice to the Agency upon initiation of any toxicological tests. The implementation of this set of proposals with the others discussed above should substantially improve the reliability and accuracy of toxicological data used in decision making.

DEPENDENCE ON INDUSTRY FOR ENGINEERING DATA

Dependence on industry for information about pollution control technologies or process modifications for pollution control presents the Agency with additional problems. Because of the diversity of industries regulated by EPA, there are no simple protocols or uniform measures of technical feasibility with which to generate and evaluate industry information.

Competitors within an industry might provide EPA with alternative sources of information. When more than one source is available, it may be possible for EPA to integrate information and analyses to form an adequate overall assessment.

For industries in which opportunities for competition are limited because of dominance by a few large companies or because unique or proprietary processes are used, the Agency must rely on independent, knowledgeable scientists and engineers to evaluate information and assessments.

In some instances, EPA's own scientists can serve this function. In the hearings on the 1972–73 auto emission decision, EPA engineers were members of a panel that helped to evaluate conflicting arguments and information. At a public hearing held by EPA on the proposed standard for vinyl chloride as a hazardous air pollutant, scientists from OR&D and several program offices participated in the questioning of witnesses.

The Agency has consciously sought to develop in-house expertise to enable it to evaluate information received from external sources. For example, a program at the Industrial Environmental Research Laboratory at Cincinnati was established to examine pollution control techniques for several industrial categories covered by the effluent guidelines section of the water act.

EPA could do more to develop the necessary expertise and to use the expertise that already exists in the Agency. Project officers for extramural grants and contracts, and engineers who write permits in regional offices are often quite knowledgeable about industry problems and practices, and should be called upon more often to evaluate data and analyses submitted to the Agency.

However, the number of industries regulated by EPA is just too large to expect the Agency to maintain current and detailed information about all possible control technologies or process alterations that might reduce pollution. The Agency must, to a great extent, rely on those independent individuals or institutions outside EPA for the evaluation of information provided by industry. Admittedly, sources of such expertise are difficult to find, but they do exist at other government agencies and in private institutions and should be encouraged and supported by EPA.

E. SCIENTIFIC AND TECHNICAL RESEARCH IN SUPPORT OF DECISION MAKING

EPA's research and development programs alone are not adequate to serve either its current requirements for technical data and analyses or its long-term need to expand knowledge of the physical, biological, economic, and social phenomena related to problems of environmental regulation.

- *The principal role of EPA's in-house laboratories should be to perform research and supply technical expertise responsive to immediate Agency needs. These laboratories should be assessed for the quality and relevance of their work and their efforts redirected where necessary. The exchange of information and views between the research and development activities and the regulatory activities of the Agency should be improved, and the scientific leaders in EPA should be more deeply involved in the regulatory decision making process.*
- *In those technical areas in which in-house capability is neither adequate nor feasible to develop (given the realities of political and bureaucratic constraints), EPA should use research centers outside the Agency; research that can better be done in other existing governmental laboratories, such as certain studies of health effects, should be carried out in those laboratories and supported by EPA.*
- *EPA should support a strong, stable, long-term program in environmental research in areas central to its regulatory responsibilities.*

Such research is best performed in institutions insulated from the inevitable day-to-day pressures of a regulatory agency. In addition to providing needed information, such a long-term program would assure development of a base of scientific and technical expertise and of facilities for training scientists and engineers who could eventually serve the federal government, state governments, industry, local communities, and public interest groups.

* * *

EPA regulations intended to limit the discharge of pollutants into the environment are based on existing knowledge about the harmful effects of these pollutants on human health and on environmental quality, and on information about the availability and effectiveness of pollution control alternatives. But the relationship between amounts of pollutant emissions and their harmful effects is rarely known with much accuracy. Similarly, complete and reliable information about pollution control alternatives is difficult to obtain.

The scientific and technical information that does exist for specific EPA decisions is often fragmentary and incomplete, and comes from many and varied sources. Some of the sources, moreover, will be directly affected by EPA decisions (see Chapter 3, Section D). As a result, the amount of "hard," reliable information available to support EPA decisions falls short of what is desirable and in most cases no quick experiments or measurements can provide definitive answers.

Directed research and development is a requirement of many government agencies whose missions depend heavily upon scientific and technical data, such as those concerned with space, defense, and energy. But for a number of reasons EPA's scientific and technical requirements are particularly difficult to meet. First, since widespread concern with the environment is relatively new and EPA's responsibilities have only recently been defined in legislation, the number of existing scientific and technical organizations with competence in addressing EPA's specific concerns is limited. Second, the range of technical and scientific issues affecting EPA decisions is unusually broad, encompassing different types of effects, different chemicals, and different industries and technologies. Third, the focus of EPA's interest changes as new data emerge and as political and economic pressures change. While such difficulties are to be expected in the first years of a new agency, they have been particularly troublesome for EPA.

Given the nature of its responsibilities, its reliance on scientific data and analyses, and the relatively primitive state of knowledge in many environmental fields, EPA cannot rely solely on scientific and technical work directed and funded by other government agencies or by industry for all the timely and relevant data and analyses necessary for its regulatory decision making. Although data and analyses from many sources outside EPA will undoubtedly be used in EPA decision making, EPA needs not only a balanced research and development program of its own that properly develops and uses in-house capabilities to support immediate needs of decision making, but also a contract program to supplement in-house capabilities and a long-term research program primarily, but not exclusively, in institutions outside EPA.

IN-HOUSE LABORATORIES

When it was created, EPA assumed responsibility for 15 research and development programs that were formerly part of various other agencies of the federal government. EPA has since attempted to organize its research effort in a more unified structure, most of it in OR&D.

At the same time that EPA was developing its research and development program, it was faced with the necessity of taking regulatory action under a number of statutes. It is recognized now, as it was then, that the time constraints of the laws forced decision making based, almost exclusively, on information already in hand, and that the development of new research programs and the generation of new information to support the early standards and regulations was not possible. Further, in some cases the laws required a complete change in the nature and amount of information necessary for decision making. (Before 1972, for example, water pollution legislation was based upon ambient water quality and water pollution laboratories were quite naturally organized to generate and evaluate information about the quality of water. In 1972, when the emphasis in water programs shifted to control technology, EPA needed information about available and feasible technologies in order to establish effluent guidelines. Not surprisingly, the existing laboratories were ill-equipped to provide such information.)

The inheritance of disparate research elements, political and time constraints, rapidly changing research targets imposed on EPA, and the amount and diversity of data needed to support the activities mandated by legislation resulted in confusion about the proper role of EPA laboratories and a subsequent loose, almost haphazard, coupling between EPA's research effort and the decisions that EPA was called upon to make. The case studies performed during the course of the present study found little evidence of direct OR&D involvement in the provision of information for decision making. (A list of the case studies can be found in Appendix E.)

The primary role of EPA's in-house laboratories should be to provide direct and immediate support for the process of EPA decision making;

their effectiveness should be measured primarily by the extent to which they fill this role. In-house laboratories can have close communication with the Agency leadership, identify with the overall mission of the Agency, and be responsive to the needs of the Agency administration to a far greater degree than can outside research organizations working on separately funded and contracted projects.

This is not to say that the scientific staff of these laboratories must be primarily devoted to responding to the frequent crises faced by the Agency administration nor that long-term, undirected research should be excluded from EPA's laboratories. Applied and mission-oriented research laboratories require a good mix of activities to remain effective and productive. Too much emphasis on the changing, day-to-day demands of the administrative and policy leadership—demands that frequently originate from political rather than technical considerations—detracts from important continuing projects and is harmful to the morale and scientific productivity of a laboratory. Further, some long-term research should be included in EPA's own laboratories to maintain high professional standards and to have scientists who are primarily concerned with fundamental scientific processes and principles available for consultation.

The skills and perspectives needed for the difficult task of managing applied and mission-oriented laboratories are different from those required to manage basic research or large-scale developments. In basic, undirected research, scientific merit as judged by a peer community is the primary measure of productivity. Large-scale developments whose end product can be well defined can be judged by whether they meet performance, time, and cost specifications. The end product of applied and mission-oriented research, however, cannot often be defined accurately. Several technical approaches may be pursued simultaneously and the potential value of the results to the sponsor, which is the final measure of merit, may not be at all clear. The managers of such efforts must simultaneously justify their program to sponsoring policymakers and decision makers who tend to be impatient with technical efforts for which they do not see immediate utility; insulate their productive researchers from what may seem to the scientific staff whimsical, irrational, or at best unnecessary demands; direct their program to the practical needs of the Agency; and yet maintain a stimulating research environment.

At EPA, the problems of managing a mission-oriented research program are aggravated by the fact that the laboratories EPA currently operates originally developed their programs and skills for federal agencies with responsibilities and priorities different from those EPA now has. At the same time, civil service and political constraints prevent EPA management from making personnel and administrative changes that may be warranted. The net effect is that EPA's in-house laboratories have to date not played as important a role in supporting EPA decision making as might have been expected or desired.

In the past, other government departments have been faced with new responsibilities and inherited technical capabilities. Generally, however, new and enlarged responsibilities have come with increased research budgets so that laboratories or groups that were judged unproductive, or whose work was less relevant to the new missions, could be bypassed if political or bureaucratic constraints kept them from being closed or restaffed or having their programs redirected. Because of its limited resources for scientific and technical support, EPA cannot use this solution.

Under any circumstances, it takes time to reorient laboratory programs, but civil service and political constraints make required changes even more difficult. EPA must now be prepared to take steps wherever necessary to redirect the programs of these laboratories, staff them properly, and link them more closely to the decision-making process. The reforms, however, should be undertaken in a manner that avoids disrupting those research activities of outstanding quality that are important to EPA's long-term environmental interests even if their work is not at present judged as relevant to immediate EPA needs as one might generally expect from in-house laboratories. First class research groups are hard to build, particularly in government; they should be carefully nurtured.

Close linkage between the technical leadership of the scientific program and top management of the Agency is vital to maintaining quality and relevance in an applied research program. This serves two important purposes since it assures that the relevant scientific and technical knowledge available in the laboratories is brought to bear on policy decisions and that the work of the laboratories reflects the priorities and technical support needs of the Agency. We find this kind of close linkage missing in most of the EPA research activities we examined (as did the report of the Review Committee on the Management of Research and Development Activities of the U.S. Environmental Protection Agency [NRC 1977: Appendix C]).

There have been instances, it is true, of OR&D participating in decision making, but these appear to be exceptions. For example, in the vinyl chloride case the Research Triangle Park (RTP) laboratories, which are part of EPA's OR&D network, have worked closely with the Office of Air Quality Planning and Standards in examining the evidence and developing the guidelines. There is no doubt that the interaction was enhanced by the geographical proximity of the RTP laboratories and program office (a state of affairs that is not generally duplicated elsewhere in the Agency), although it does appear that the air program office demonstrated an inclination to work with OR&D on this problem.

EPA has recognized the need to strengthen the coupling among all parts of the Agency. In those cases in which working groups are used, EPA guidelines require that representatives of all parts of the Agency be involved. (In some areas, pesticides for example, working groups have not been used and there the link between research laboratories and decisions is almost nonexistent. EPA has recently adopted a working group system for some pesticide decisions. (A discussion of the function of working groups in Agency decision making can be found in Appendix C.) However, OR&D representatives on working groups are often located in field installations and cannot always attend meetings of working groups since these are frequently held on short notice in Washington. It is not unusual for OR&D personnel to contribute at an early stage to the working groups and then to lose touch with the decision-making process for periods of many months. When they finally regain contact, their early inputs have been lost or irrevocably altered. Clearly, a more vigorous Agency commitment to the success of the working group system and the flexible use of funds to allow active participation of all parts of the Agency could go a long way toward resolving this problem and toward establishing a better coupling between the Agency's research efforts and its decision-making process.

OR&D's involvement in decisions could be strengthened if OR&D regularly contributed analyses and interpretations of information to be used in Agency decision making. This assessment function is being performed now although on an irregular, ad hoc basis. "Criteria documents" are required by law for some pollutants; STAR (Scientific and Technical Assessment Report) documents have been prepared on occasion. (The report of the Environmental Research Assessment Committee [NRC 1977] discusses this potential role for OR&D in some detail.)

CONTRACT LABORATORIES

Civil service personnel policies and salary constraints can impede the establishment and maintenance of high quality research institutions. An administrative device often used by government agencies to avoid this difficulty is to supplement their own laboratories with research laboratories or groups managed by not-for-profit organizations or by universities under contract. The essence of this approach is that the whole laboratory or group is devoted to and identified with its government sponsor and that the activity has continuing long-term support. There have been and still are many examples of successful laboratories designed to serve essentially in-house roles for other government agencies. During World War II, MIT's Radiation Laboratory was created to be the nation's primary radar development institution. Now, the Energy Research and Development Administration (ERDA) depends entirely on the two University of California-managed laboratories at Los Alamos and Livermore for all its nuclear weapon design and development activities and makes great use of other contract laboratories for research and development of energy technologies.

There is no assurance that the use of contract laboratories will succeed and it is possible to burden the process of establishing a special laboratory with so many political and extraneous issues that it becomes impossible to meet the original objective of creating the laboratory. Nevertheless, in reviewing its needs for in-house laboratory services, EPA should consider the possibilities of contract research laboratories. Such laboratories provide a potentially useful means for meeting the needs of EPA in the event that establishing a new civil service laboratory or reorienting an existing one is not feasible.

CONTRACTED PROJECTS

EPA's in-house laboratories could not possibly supply all the research required by EPA management. The range of technical fields and specialties is broad, and technical questions will continue to arise in fields that require expertise and capabilities not represented among EPA's personnel. EPA will, therefore, continue to need the support of industrial, not-for-profit, and other government laboratories on a contract basis. Projects that can be well defined, that involve routine procedures, or that for other reasons do not need close communication with EPA's management are especially suitable for contracting with industrial laboratories. The timeliness and usefulness of such projects will be strongly dependent on the quality of contract supervision provided by EPA.

LONG-TERM RESEARCH

EPA has, in its early years, quite understandably focused on immediate and pressing problems, but the quality of environmental decisions in the years ahead will surely suffer without a strong foundation of long-term research.

Much of the information and analysis that EPA ideally should have for sound decision making simply is not available now, cannot be made available quickly, and ultimately can develop only from long-term research programs. This is particularly true of the determination of health effects of long periods of exposure to small doses of toxic chemicals alone or in combination, of the determination of the net effects of pollution on the ecological balance, and of the determination of the distribution and fate of pollutants discharged into air and water. There are many specific and technically challenging problems in these categories for which no standard investigatory techniques and methodologies are available. There are, of course, many research laboratories in the United States that have worked on certain aspects of some of these problems, but few have directed their programs at the broad sweep of environmental questions now being addressed by EPA. A large fraction of the nation's environmental research that covers many technical areas of interest to EPA is being sponsored and carried out in other government agencies such as the National Institute of Environmental Health Sciences, the National Cancer Institute, and other components of the National Institutes of Health, the Food and Drug Administration, agencies in the Department of the Interior and Department of Agriculture, the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the Nuclear Regulatory Commission, the National Oceanic and Atmospheric Administration, and in industry and not-for-profit organizations. But only if EPA becomes a major sponsor of long-term research can it be sure that its own long-term interests are served and that it develops the necessary close contact with leading scientific and technical efforts in government laboratories, universities, and private research institutions.

In addition to providing research support for EPA, a strong, long-term research program related to EPA's needs would help maintain the scientific and technical standards of EPA's in-house programs and would help train scientists and engineers for eventual employment in government, industry, and public interest groups. An active research community would also serve as a technical constituency for EPA to provide added expertise on immediate problems when necessary to review research proposals, and to review the scientific basis for EPA decisions (see Chapter 3, Section C).

Unfortunately, EPA does not yet have effective working ties with many laboratories in other government agencies and with university and not-for-profit groups. EPA is not now perceived to be as effective a sponsor and user of fundamental research as many other mission-oriented government agencies. To correct this situation, EPA will require enlightened technical leadership and stable, long-term funding. For the latter, Congressional understanding and support will be needed.

F. STATUTORY DEADLINES ON ADMINISTRATIVE ACTIONS

At times, statutory deadlines on EPA administrative actions have had the disadvantage of forcing the Agency to make decisions without the benefit of new, potentially useful information, but, on balance, they have had a beneficial effect on the Agency's decision making. The major disadvantage of deadlines could be removed if statutes were to permit extensions in cases in which additional information, essential to sound decision making, would be available in a reasonable amount of time.

- *Statutory deadlines should continue to be imposed on EPA's administrative actions. They should reflect a realistic view of the time required to make a reasonable assessment of available information. There should be provisions permitting EPA to extend deadlines under certain conditions and for specified periods.*

Any authority granted EPA to use extension provisions should be conditional on the Agency establishing that: (a) it requires additional time to gather or interpret technical information identified by EPA as essential to a decision; (b) it has made an effort in good faith to obtain this information; and (c) it has considered the adverse effects of postponement. When EPA has decided on the need for and duration of an extension, it should issue a public notice well in advance of the original deadline. EPA's decision should be subject to review by a federal Court of Appeals at the time of the public notice.

In the case of deadlines for submission of comment by interested parties on EPA's proposed rule making, there is a need to provide more time for better informed and more effective comment.

* * *

As a part of Congressional efforts to mandate rapid improvements in environmental quality, all statutes that EPA must implement provide for some deadlines. The statutory deadlines come in two forms: (1) deadlines for attainment of certain environmental protection goals, such as the 1977 requirement for industries to use the best practicable water pollution control technology currently available, and (2) deadlines on administrative actions, such as the 120-day deadline for EPA's setting of primary ambient air quality standards. While both types of deadline affect regulatory decisions, the latter has the greater direct impact on EPA's decision-making process and is the subject of this recommendation.

Deadlines on EPA's administrative actions have at times been criticized because they do not permit EPA enough time to acquire and analyze information on which to base regulatory decisions. The general statutory schedules for EPA actions do not normally provide time for EPA to undertake new research efforts on the scientific and technical issues involved in regulations. As a result, EPA can only use readily available data. The benefits of waiting for further research and refinements are uncertain and may not justify a delay in action. Although it generally will not be possible to allow time for new research, deadlines should at least assure sufficient time for EPA to gather and analyze all the existing basic information.

Deadlines can also restrict outside input to the decision-making process. All EPA rule making must allow some time for outside review and comment on proposed actions to permit new information, new analyses, and different points of view to be brought to bear on the decisions. However, representatives of both industrial and environmental interests have complained that the time provided for comment, either by EPA or the law, is insufficient. Often interested parties first learn of the details of an EPA decision from the published notice of a proposed regulation in the Federal Register. The problem of inadequate time for comment could be remedied by systematically providing a sufficient public comment period between the dates of publishing proposed and final regulations or by the use of the combined comment period recommended in Chapter 4, Section H that would allow a longer time for review by government agencies and the public.

The laws often provide for court-enforceable deadlines that set dates for final agency action and for interim steps leading to the final action. For example, Section 112 of the Clean Air Amendments (42 USC 1857c-7 1970) provides for rule making to establish standards for hazardous air pollutants. EPA is given 450 days from enactment of the law to promulgate the standards. Of the 450 days, 90 are allotted for publication of a list of hazardous pollutants, 180 for publication of proposed standards, and 180 for publication of the final standards. EPA must hold a public hearing on a proposed standard within 30 days after its publication. When EPA failed to meet the 450 day deadline under

Section 112, the Environmental Defense Fund brought a citizen suit, and the court ordered EPA to publish final standards by March 30, 1973, more than 800 days after enactment of the law (*Environmental Defense Fund* v. *Ruckelshaus* 1973).

The existence of strict administrative deadlines has been both praised and criticized for a number of reasons. Among the supporting arguments are that strict deadlines:

- force the Agency to gather available information rapidly and to act on environmental problems without undue delay;
- enable the Agency to resist external pressures for delay;
- reflect a policy decision by Congress that action must be taken even if all technical information is not in hand; and
- provide a means for Congress to set national priorities.

However, strict deadlines:

- may not permit the generation, acquisition, or analysis of new scientific and technical information that might have an impact on the decisions. (Some of the water effluent guidelines were overturned in the courts because they were not based on sufficient data, a situation that might not have occurred had more time been available.)
- often create procedural and administrative problems for the Agency, even if the information is in hand. Tight deadlines can mean that inadequate time is allowed for public comment on proposed standards and regulations. In addition, deadlines can force the diversion of limited resources to lower priority matters that fall under deadlines (such as regulation of small point sources of water pollution) causing the neglect of problems for which there are no deadlines (such as regulation of larger nonpoint sources of water pollution).
- can limit the time available for negotiation between EPA and interested parties and thus can force confrontation between affected parties and EPA.

In addition, EPA experience reveals that deadlines have additional effects that may or may not be considered beneficial. Time constraints on the decision-making process force EPA away from overly formal trial-type procedures to less time consuming informal procedures (Zener 1974). This was the case in EPA's consideration of whether to suspend automobile emission limitations where time constraints restricted the use of full trial-type procedures. Under Section 202(b) of the Clean Air Amendments, (42 USC 1857[f-1][b][4] 1970), EPA was to determine, within 60 days after receiving an application requesting suspension, whether to suspend for one year the timetable established in the Act for compliance with motor vehicle emission standards. This short deadline for making a detailed inquiry into the state-of-the-art of emission controls and into the efforts of an applicant automobile manufacturer forced EPA to use less than full trial procedures for a hearing on these issues. Consequently, EPA established an improved form of legislative hearing with opportunities for conferences among the technical experts and for limited cross examination. The merits of less formal procedures are discussed in Chapter 4, Section G.

Deadlines can also have the effect of allowing external factors to influence EPA's priorities. By using citizen suit provisions in the laws, interested parties can use the deadlines to apply pressure on EPA to act on issues that they consider significant. Matters viewed as less important, matters important to less organized interests, or matters not subject to statutory deadlines may then be given lower priority by EPA. For example, an organization of truck and bus drivers sued when EPA failed to meet the deadlines for publication of proposed noise emission standards on heavy duty trucks. As a result, EPA changed its plans for publishing the noise emission standards for trucks at the same time as other standards and instead quickly published the noise standards for heavy duty trucks, delaying publication of the other standards (*PROD Inc.* v. *Train* 1976).

In general, the statutory imposition of deadlines for administrative decisions by EPA, combined with enforcement of such deadlines through litigation by citizen groups, has been beneficial in allowing and forcing EPA to implement its program responsibilities. It should be noted, however, that in practice deadlines neither assure that the action will be taken by the specified date nor limit totally the ability of the Agency to delay for purposes of gaining new information. EPA's experience with deadlines reveals a flexibility inherent in the current process.

Often EPA chooses not to meet deadlines for administrative action. If no threat of litigation exists, EPA is relatively free to impose its own time restrictions. For example, after meeting deadlines for publishing proposed standards and implementation regulations under the Safe Drinking Water Act, EPA decided to delay final publication to allow more time for affected parties to participate in the decision-making processes. No court action ensued, and the final standards were published 12 months after enactment rather than 9 months, as provided by law.

Even when citizen suits are brought to enforce the deadlines, new court-ordered deadlines or compliance schedules are often a result of negotiations among the parties that allow the court to balance the need for time to gather and analyze information with the requirement for quick action. Since suits to enforce deadlines normally can not be brought until after the statutory deadline has passed, the suit can only attempt to speed up the decision-making process and cannot force literal compliance with the original deadline. In the example of standards for hazardous air pollutants, discussed above, the process of deadline enforcement by suit allowed EPA one year more than the statute permitted to complete the action.

EPA's failure to meet the one-year deadline for publication of guidelines for best practicable technology under the Federal Water Pollution Control Act Amendments of 1972(33 USC 1314[b][1][A] 1975) was met by a suit by the Natural Resources Defense Council (NRDC) (*Natural Resources Defense Council* v. *Train* 1974). EPA had stated that it would be unable to meet the one-year requirement and that it would publish the guidelines in three groups in the course of an additional year. The result of the NRDC suit was a court-ordered schedule not very different from the schedule EPA had laid out for itself. The schedule has since been extended by the court with agreement of the parties. Thus, the statutory deadline had the effect of keeping the pressure on EPA to act as quickly as possible, but, through court recognition of the difficulties involved, an extension was granted.

The fact that EPA actions have not been strictly governed by actual legislated deadlines highlights several negative characteristics of the current use of deadlines. The time necessary to carry out a statutory requirement such as setting a standard is difficult to predict, and Congress may occasionally establish too strict a deadline. However, the violation of a statutory deadline will not only affect the timing of that decision but will often result in delays in the whole schedule for environmental improvement envisaged in the law. Also the failure of EPA to meet statutory deadlines will make it difficult for EPA to argue for strict compliance with attainment deadlines by industry.

While deadlines are not strictly enforced, the lack of deadlines for administrative action can subject EPA to pressures and cause unnecessary delay. For example, a combination of factors such as difficulty in developing a regulation, reluctance to act in the face of uncertainties, outside pressures to avoid or delay regulation, and demands of other responsibilities on the Agency has resulted in EPA's failure to promulgate regulations for the discharge of hazardous substances under the 1972 Water Act (33 USC 1321 1975) which are not governed by explicit statutory deadlines. It is only when EPA's failure to act within a reasonable time becomes identified as an obvious disregard for its responsibilities that the Agency can be forced to take action when there is no deadline on the action. The Natural Resources Defense Council successfully applied pressure on EPA to publish guidelines for recycling of beverage containers (*Natural Resources Defense Council* v. *Train* 1973), despite the fact that Section 209 of the Resource Recovery Act of 1970 (42 USC 3254c 1970) only requires such action "as soon as practicable." EPA recognized that a court was likely to find that a delay in excess of the time already taken would be a violation of the intent of Congress.

Deadlines are an effective counter to the natural tendencies for delay; however, a modification of the current practice could retain the benefits and overcome the disadvantages. The recommended authority to extend deadlines for specific periods under certain explicit conditions would allow EPA to evaluate its time constraints and, when necessary, extend the time to gather and analyze data essential to the decision. Under this procedure EPA could choose between alternative approaches to an action and could weigh more judiciously the need for a speedy decision against the time constraints on acquiring and evaluating information. EPA can now extend deadlines simply by informally choosing not to abide by the time limits; the recommendation would reduce such informal action by requiring a reviewable notice of EPA intent to extend the deadline to be made public well in advance of the original deadline. The notice would provide a basis upon which parties can decide, prior to bringing a law suit, whether EPA's delay is justified.

There could, however, be some problems with a system that allows EPA to extend its own deadlines. The tendency to delay until "just one more study" is completed is always strong, and it may be difficult for anyone to assess objectively at some later date whether EPA was justified in extending a deadline to gather this additional information. The extendable deadline can be designed to minimize the possible abuse of authority. To extend a deadline, EPA should be required to provide clear and explicit statements of the need to extend and to weigh these against the adverse effects of delay. EPA should specify what information it needs and intends to acquire during the extension period and not merely express a general need for additional data. Since both the adverse effects and the benefits to be realized from delay will often be speculative, the burden should be on EPA to adhere to statutory deadlines with extension being the exception rather than the rule.

With statutory deadlines that are consistent with the type of action required of EPA, the authority to extend deadlines should result in a more rational decision-making process and the swift review of unjustified delays.

REFERENCES

Environmental Defense Fund v. *Ruckelshaus* (1973) 3 ELR [Environmental Law Reporter] 20173 (D.D.C.).

National Research Council (1977) Research and Development in the Environmental Protection Agency. Analytical Studies for the U.S. Environmental Protection Agency, Volume III. Report of the Environmental Research Assessment Committee, Environmental Studies Board, Commission on Natural Resources, Washington, D.C.: National Academy of Sciences.

Natural Resources Defense Council v. *Train* (1973) 6 Environment Reporter—Cases 1033. (D.D.C.), reversed in part and remanded with directions 510 F 2d 692 (D.C.Cir., 1975).

Natural Resources Defense Council v. *Train* (1974) No. 74-1202 (N.D.Cal. filed 1974).

PROD Inc. v. *Train* (1976) 8 Environment Reporter—Cases 1887 (D.D.C.).

Sontag, J.M., N.P. Page, and U. Saffiotti (1976) Guidelines for Carcinogen Bioassay in Small Rodents. National Cancer Institute, Carcinogenesis Technical Report Series No. 1. Washington, D.C.: U.S. Government Printing Office.

U.S. Environmental Protection Agency (1975a) Pesticide programs: Guidelines for registering pesticides in the United States. 40 FR 26801.

U.S. Environmental Protection Agency (1975b) Pesticide programs: Registration, reregistration and classification procedures. 40 FR 28241.

U.S. Environmental Protection Agency (1976) Reliability of pesticide test reports: Advance notice of proposed rulemaking. 41 FR 23920.

U.S. Food and Drug Administration (1976) Nonclinical laboratories studies: Proposed regulations for good laboratory practice. 41 FR 51205.

U.S. General Accounting Office (1976) Letter Report to Administrator of EPA on EPA's Basis for Determining Whether Pesticide Safety and Efficacy Data is Complete, Accurate, and Reliable for Registering Pesticides and Establishing Tolerances. Resources in Economic Development Division, B-133192, RED-76-63. Washington, D.C.: U.S. General Accounting Office.

Zener, R.V. (1974) Comments. Pages 516-520, Panel III: Decision making in agency proceedings. Administrative Law Review 26(4):489-529.

4 Procedural Considerations

G. PROCEDURAL REQUIREMENTS FOR DECISION MAKING

Traditional procedural requirements established by statutes and court decisions for agency action have not always been well suited to the types of decisions made by EPA. As a result, EPA, under the direction of federal courts and on its own initiative, has experimented with innovations in procedures. A number of these innovations have had a beneficial effect on the decision-making process and can be used more widely. Several additional changes in the procedures could be developed to assist in decision making and to make the decision-making process more open to external review.

- *EPA should make greater use of procedural innovations developed within EPA and other federal agencies that, when combined with steps to increase openness in the Agency and the use of explicit analysis, will reduce the need to rely on formal procedures characteristic of trials and adjudications.*

Unless formal trial procedures are required by law, EPA should use procedures that may be less time consuming and expensive than trial-type procedures, such as exchange of documents and informal questioning. Such procedures should neither materially reduce the consideration of scientific and technical information, nor deny parties fairness or due process of law.

Formal trial procedures generally should not be imposed on EPA decision-making processes; however, when Congress has chosen to do so, steps should be taken to streamline the procedures.

EPA should institute a more orderly procedure for compiling the relevant documentary record and making its contents easily available to the public. In addition, EPA should explicitly define and adhere to policies stating which information submitted by regulated parties and which internal memoranda should be available to the public.

EPA should make public an understandable summary of the rationale for each regulatory decision (including decisions not to take action) by publishing at the time of notice of proposed rule making a complete statement of the basis for its findings and its reasoning, including descriptions of (1) the scientific, economic, and other information (including information on statutory requirements and judicial decisions) relied on to evaluate the alternatives and the uncertainties in the information; (2) the analyses used in making the decision; and (3) the relative importance given to conflicting considerations in reaching the decision. Revisions of this statement should be included within the preamble to the final decision.

* * *

The basic purpose of procedures required by law is to improve the quality of the Agency's decisions by defining steps that must be taken in the decision-making process and by opening the process to external scrutiny and comment. To be effective, such requirements must avoid imposing undue burdens or delays. Many of the specific procedural steps required of EPA are set out in the statutes authorizing EPA's action or in more general laws governing all agencies' administrative actions. Others have been developed by the courts. However, EPA enjoys a considerable measure of flexibility to develop procedures most appropriate to its various responsibilities.

PROCEDURES ESTABLISHED BY STATUTES

The two basic legal procedures recognized in the federal Administrative Procedures Act (APA) (5 USC 553-557 1970; Davis 1972:88-215)[1] for agency action are *notice-and-comment procedures*, requiring agencies to notify the public of proposed action and to afford the public an opportunity to comment on that action, and *trial-type hearings*. Agency decisions are also divided into two distinct classes under the APA, rule making, which consists of the formulating of rules of general applicability and future effect, and adjudication, which consists of the application of rules to particular cases (Stewart 1975:1671-1674).

When an administrative agency's decision involves applying a regulation to an individual and when the applicability of the regulation turns on whether or not particular facts exist, the law has generally accorded the person against whom the rule is to be enforced the right to a trial or formal hearing before the agency. At such a hearing, the agency is required to present witnesses and evidence to establish its case and the respondent has the right to cross-examine and to introduce rebuttal evidence. Detailed scientific and technological information may be necessary to establish the case, and all parties are given an opportunity to examine the validity of the evidence through an adversary proceeding. Trial procedures may not be the most expeditious means of arriving at scientific or technological truth, but they do permit, though they do not guarantee, an exhaustive review of the facts presented.

On the other hand, in those cases in which the agency's decision involves establishing a rule, trial-type procedures are less likely to be appropriate, particularly when the rule will affect many people. In such cases it might well be impracticable to afford all those affected the right to participate in a trial-type hearing. Moreover, the issues involved in devising a general rule often turn on considerations of policy or broad empirical judgments, questions for which trial-type procedures may be ill-suited. Accordingly, the law has generally required agencies to follow notice-and-comment procedures rather than trial-type procedures in formulating general rules. In practice, however, the distinction between rule making and rule applying often breaks down, a fact that makes it difficult to place all decisions into one of two categories. Moreover, in some cases, statutes require that trial-type hearing procedures be used in rule making.

While the APA framework applies when an agency has no other statutory guidance, Congress has normally added to the statutes authorizing agency action procedures that differ from the traditional models of trial-type adjudication and notice-and-comment rule making.

[1] Gaines, S.E. (1976) Decision Making at the Environmental Protection Agency: A Comparative Analysis of Internal Rule Making with Two Types of Hearing Procedures; prepared for the Committee on Environmental Decision Making.

The various statutes are rarely consistent in the requirements for procedures. As a federal judge remarked: "One would almost think there had been a conscious effort never to use the same phraseology twice" (*Associated Industries* v. *United States Department of Labor* 1973: note 2). The novel, unclear, even contradictory character of these special procedures often makes it difficult to relate them to the basic procedures of the APA or to determine their meaning. However, they can be catalogued roughly as follows:

1. Notice-and-Comment Rule Making: Various statutory provisions refer either explicitly or implicitly to the informal notice-and-comment rule-making requirements of the APA.
2. Notice-and-Comment Rule Making with a Public Hearing: Some EPA statutes provide for informal notice-and-comment rule-making procedures and also for a legislative or public hearing, with an opportunity for oral testimony but not cross-examination.
3. Rule Making on a Trial-Type Hearing Record: Several statutory provisions require rule making "on the record" after a hearing, thereby triggering APA trial-type procedures.
4. Unclear Rule-Making Provisions: Some provisions specify procedures, the precise intent of which is unclear, such as the language in Section 119 of the Clean Air Amendments which requires EPA to afford "an opportunity for written and oral presentations of data, views, and arguments" (42 USC 1857c-10 1975).
5. Adjudication on a Trial-Type Hearing Record: Generally statutes require EPA to follow trial-type procedures for adjudicatory proceedings.
6. Consultation Requirement: Statutes administered by EPA contain numerous requirements that EPA consult with other governmental bodies before taking action.
7. Advisory Committees: Statutes administered by EPA contain a number of provisions for use of advisory committees, and these provisions vary from the one extreme of leaving the use of such committees entirely to EPA's discretion, to the other extreme of requiring EPA to confer formally with permanent advisory bodies.

INNOVATIVE PROCEDURAL REQUIREMENTS

The seven types of procedural requirements established by the statutes are used in varying combinations to govern EPA's authority but do not alone define the exact procedure that will be employed for any given decision. EPA and the courts have been involved in interpreting the statutes and adding new steps to ensure fair and effective procedures. EPA has considerable discretion to modify the procedures within the statutory framework when carrying out its rule-making and adjudicatory authority. Many of the innovations employed by EPA or required by courts have improved the decision-making process by permitting the timely consideration and careful examination of scientific and technical information and protecting the legitimate interests of all parties. EPA should continue to develop and use the innovations described below.

1. The transformation of traditional notice-and-comment rule making: Given the large resource commitments and important public health and welfare concerns potentially involved, merely requiring EPA to observe traditional notice-and-comment procedures in its decisions often does not afford sufficient procedural protections. For instance notice-and-comment rule-making procedures traditionally do not require the Agency to base its decision on any specified set of materials, and call for only a brief explanation by the Agency of its action. Such procedures may not afford affected parties an adequate opportunity to affect Agency policy, may not assure that all relevant information is taken into account, and may not provide a sufficient record to permit effective judicial review. Conscious of the inadequacies of traditional notice-and-comment procedures but chary of the hazards of requiring trial-type hearings, the federal courts have developed new sets of procedures to govern EPA decisions. The improvisation has been successful in improving the quality of EPA decision making and in providing a realistic basis for judicial review without unduly inhibiting the Agency's ability to get its job done.

The new procedures have been developed through judicially imposed extensions of traditional notice-and-comment procedures. The first step was a requirement that EPA articulate the grounds for its action in far greater detail than had ordinarily been required in the past (*Kennecott Copper Corp.* v. *EPA* 1972). In addition, EPA has been required to respond, in its decisions, to the criticisms and contrary evidence adduced in comments by those opposing EPA's proposed action (*Portland Cement Association* v. *Ruckelshaus* 1973).

In essence, "paper hearings" that permit each party to introduce information and to respond to the opponent's case and that require the agency to base its decision on the materials thus developed are being instituted. This procedure thus has the advantages of a trial-type hearing with the exception of live testimony and cross-examination while avoiding many of the drawbacks. Agency personnel, environmental advocates, and industry lawyers have all expressed considerable satisfaction with this procedural innovation and its effects on the quality of Agency decision making.

Existing "paper hearing" procedures at EPA could, however, be improved. The documentary records developed are often unwieldy and chaotic, so that parts of the records are difficult to acquire and the burden on interested parties and reviewing courts is consequently heavier (Pedersen 1975). Moreover, the necessity of using litigation under the Freedom of Information Act to obtain some relevant documents has wasted the time and resources of all concerned. EPA should provide a central repository for the record of each proceeding in which all relevant documents can be filed in orderly fashion and made freely available. This record should include all documents relied on for a decision and the analysis (such as described in Chapter 2, Section A) performed by EPA.

2. "Rule making plus": In response to statutory requirements or the perceived needs of improved decision making, EPA and the courts have adopted additional procedures to be used in conjunction with the recently developed "paper hearing" rule-making practices. The resulting hybrid procedures may conveniently be labeled "rule making plus" (Williams 1975).

Where statutes have required EPA to base regulations or other actions on a public hearing, EPA has interpreted the statutory language as requiring only a legislative hearing. In a number of contexts, EPA has used a form of legislative hearing procedure in which a panel of EPA administrators and technical staff question industry and environmental representatives on technical issues. Such proceedings, conducted on an informal basis, have often evolved into a discussion among representatives of the various interested parties and EPA. While interested parties normally have not been permitted to cross-examine, they have been permitted to submit to the EPA panel written questions which were then posed to the technical representatives. EPA has successfully used this "panel questioning" procedure in the proceedings on applications for extension of the motor vehicle emission deadlines. The procedure allows EPA to elicit information and probe difficult issues, while avoiding the delays associated with trial-type hearings. Environmental and industry representatives generally concur in a favorable assessment of the panel questioning technique, although they believe that EPA panels have sometimes failed to follow up written questions or to probe deficiencies in the answers vigorously enough.

More controversial procedures have resulted from the occasional court decisions that have gone beyond the requirements of detailed explanation, a "paper record," and legislative hearings. For example, in

International Harvester Co. v. *Ruckelshaus* (1973), the Court of Appeals, after setting aside EPA's refusal to grant an extension of automotive emission deadlines and remanding the case for further proceedings, indicated that limited cross-examination would be an appropriate means of dealing with directly disputed technical issues. A review of the actual procedures used by the parties upon remand in these and similar decisions indicated that the industries challenging EPA's position did not, in the end, insist upon the use of the formal trial-type procedures; instead, technical issues were considered through exchange of documents and informal meetings between technical experts. Although the more informal procedures may have been successful partly because any of the parties could have invoked the right to cross-examination, the experience suggests that broadly focused technical or economic issues can be elucidated without resort to cross-examination.

3. Reduced reliance on trial-type procedures: Several statutory provisions require the use of trial-type processes; most notably in the case of EPA proceedings following the issuance of a notice of intent to cancel or suspend registration of a pesticide. A number of cancellation and suspension proceedings have resulted in elaborate trials before an administrative hearing officer (generally an administrative law judge) involving numerous witnesses and extensive cross-examination, followed by the hearing officer's recommended decision, a decision by the EPA Administrator, and court review (Spector 1976). EPA Chief Administrative Law Judge Perlman attempted, with some success, to streamline the procedures in these administrative trials to eliminate unnecessary delay and expense. For example, direct testimony was submitted in writing, and oral testimony was limited to responses to cross-examination. In addition, the use of time limits for suspension hearings has been authorized by the pesticides law; this appears to have had the beneficial effect of forcing the parties to limit their cases, thus avoiding the introduction of extraneous matter. Nonetheless, the administrative trial process remains costly, time-consuming, and cumbersome.

Judges, industry lawyers, and environmental representatives who advocate continued use of trial-type procedures stress the value of cross-examination in probing the assumptions and factual bases of a party's position and exposing bias and other weaknesses. Judge Perlman has stressed the value that he finds in observing the demeanor of witnesses and in the opportunity for asking questions of a witness. On the other hand, cross-examination can be (and has been) exploited as a delaying tactic, and is sometimes used by lawyers more with intent to discredit the witness on minor points than to probe the merits. Many scientists and other technically qualified experts believe that cross-examination is not a helpful method of exposing the relevant scientific and technical issues, and that use of adversary trial-type procedures often distorts the state of scientific and technical agreement and disagreement on a given matter.

It may be possible to devise hybrid procedures to reconcile, at least in part, these contrasting views. There is something to be said for using cross-examination for such critical factual issues as the accuracy of key data. On the other hand, there is some doubt about whether the benefits of cross-examination on more broadly focused scientific and technical issues, such as the appropriate criteria for evaluating carcinogenicity or for evaluating epidemiological data, are worth the costs involved. As noted above, alternative procedures—such as on-the-record conferences among technical experts or the panel questioning technique (which permits EPA decision makers to probe positions of witnesses without creating an open-ended right of cross-examination by all parties)—appear to be a less burdensome and more productive means of developing relevant information in a form useful for decision makers. Experimentation under the Toxic Substances Control Act and other laws that direct EPA to allow cross-examination in certain cases should help determine when cross-examination is beneficial.

Proponents of continued use of administrative trial-type hearings also contend that such procedures ensure greater accuracy and impartiality in decision making by providing for the taking of evidence and the preparation of an initial decision by a hearing officer independent of the Administrator and the EPA employees who play advocates' roles. An important purpose of the Administrative Procedure Act was to separate prosecutorial and adjudicatory functions by providing for hearing officers and by insulating agency heads from contact with prosecutorial personnel within the agency when the agency heads hear and decide appeals from the hearing officer's initial decision.

It is questionable whether this separation of functions is feasible or desirable in an agency such as EPA. The impartiality guaranteed by separation of functions affords the additional accuracy that is essential for resolving specific factual controversies but is less necessary for the more broadly focused scientific and policy judgments often appropriate to EPA's rule making. Moreover, it may be significant that in recent pesticide decisions neither the Administrator nor reviewing courts have accorded great weight to the conclusions of the administrative law judge on the central disputed issues, not because of any lack of confidence in the judge, but because the issues in question turn ultimately on judgments of policy for which the Administrator bears primary responsibility.

The EPA experience raises serious questions about the wisdom of continuing to base decisions, such as pesticide cancellation decisions, on administrative trials. At the very least, it suggests the desirability of requiring a party seeking a hearing to specify precisely, subject to rebuttal by other parties, the issues on which a hearing is sought and the evidence that would be brought forward. Such threshold requirements, which have been successfully used to eliminate or drastically reduce the use of trial-type hearings at FDA, would make it possible to grant a hearing on a narrow, critical issue (such as the accuracy of crucial monitoring data) without implying that a trial-type hearing would be available on other issues in other contexts. EPA's current attempt to develop a hybrid procedure for permit issuance hearings under the FWPCA should provide useful experience in developing decision-making steps that do not rely entirely on trial-type procedures.

EPA should continue to develop and use the innovative modifications in the basic procedures required in the statutes. In cases of notice-and-comment rule making, the "paper hearing" with a central file for the documentary record should be employed. If a law provides for hearings for rule making, EPA should use conferences and panel questioning procedures to avoid the need for more formal trial-type procedures. If a law requires the formal procedures characteristic of trials for rule making or adjudicatory actions, EPA should take steps to reduce the time and resource burden of full trial-type hearings. Clearly, the procedure used in any situation must reflect the time in which the decision must be made, the need to afford some adjudicatory privileges to the participants, the type and complexity of the scientific, technical, and economic issues involved, and the need to provide a fair and open proceeding.

OPENNESS IN DECISION MAKING

Whether a decision is reached using notice-and-comment procedures, trial-type hearings, or some combination of procedures, EPA should ensure that an orderly system for access is established to facilitate review by outside interests. The decision-making process should be open to scrutiny by any outside party to ensure that the decisions reflect all interests and are credible to the public. EPA should establish a systematic procedure for compiling documentary records and should issue decision papers to explain fully its actions and the rationale for the actions. In addition, EPA should develop explicit policy guidelines to explain the types of information and documents that are to be made available for public review.

The central file for documentary records (explained above) should contain all information and analyses used in making each decision. In addition, a full explanation of the information and methodology used in a decision should be published by EPA. A decision paper that expands upon the present preamble to the Notice of Proposed Rulemaking in the *Federal Register* should be prepared to inform the public of what information was available to EPA and what information was in fact relied upon. Any analysis (such as that described in Chapter 2, Section A) used by EPA to formulate the policy should be described in easily understandable terms and the relative weight given to conflicting considerations should be discussed. Such a paper should be prepared for any major rule-making decision (including decisions not to establish a regulation or standard) and should be published together with the Notice of Proposed Rulemaking. At the time of final promulgation of a rule or regulation, amendments to the decision paper should be published to inform the public of any new information, changes in the weight given to the information, and changes in the analysis.

EPA should also ensure that the public has access to documents in the record needed to understand and evaluate an EPA decision. Consistent and appropriate decisions on what information should be available to the public can best be made when there is an explicit statement of policy to govern actions of EPA personnel and the requests of outside parties. Currently the statutes providing EPA with regulatory authority contain provisions for public access to certain information, such as monitoring data, that industry is required to submit to EPA. In addition, the Freedom of Information Act (FOIA) (5 USC 552 1975) provides, with certain exceptions, public access to documents in the possession of federal agencies, and the Federal Advisory Committees Act (FACA) (5 USC App.1 1975) similarly provides for public access to meetings of federal advisory committees. The FOIA and FACA allow information to be withheld from the public only if it falls within certain statutory exceptions.

Section b[4] of the FOIA (5 USC 552b[4] 1975) allows an agency to protect trade secrets and confidential commercial or financial information if disclosure would either (1) cause substantial harm to the competitive position of the person from whom the information was obtained, or (2) impair the government's ability to obtain necessary information in the future (*National Park and Conservation Association* v. *Morton* 1974). The environmental statutes contain provisions for nondisclosure of "methods or processes entitled to protection as trade secrets" (Section 114 of the Clean Air Amendments, 42 USC 1857c-9 1975). Special difficulties are presented by the Federal Environmental Pesticides Control Act (FEPCA), which not only protects as trade secrets some information contained in EPA's general files but also provides that parties can use information that was supplied by some other party, such as test data.

Some industries have complained that EPA's administration of these statutory provisions has not sufficiently protected competitively sensitive information. This complaint has been most frequently voiced in the context of pesticides regulation, where manufacturers regularly use the FOIA to obtain information submitted by competitors; requests seeking such information represent the vast majority of the nearly 2000 FOIA requests that have been filed with EPA (U.S. EPA 1976). There have also been complaints of inadequate EPA protection of confidential information in connection with the air and water programs; a concern frequently expressed is that EPA gives confidential information to contractors who may retain it and use it for other purposes.

In the past, EPA's administration of the various statutory provisions relating to confidentiality has not always been clear or consistent. The Agency's Office of General Counsel, however, has recently prepared a comprehensive set of regulations to deal with the issue of confidential information under the pesticides law (Zener 1976). This practice should be followed for all EPA laws to establish explicit guidelines for public disclosure of information supplied by industry.

The FOIA also requires EPA to disclose documents generated within the Agency, subject to an exemption for certain interagency and intraagency memoranda (5 USC 552b[5] 1975). The exception is designed to facilitate the frank and free exchange of views in governmental decision making. In some cases, however, where EPA has sought to keep confidential technical and policy documents that played a role in the adoption of standards or regulations, litigants challenging the standards and regulations in court have been successful in using the FOIA to obtain them. EPA has voluntarily released, on an ad hoc basis, internal Agency documents that could be protected from compulsory disclosure under the FOIA if the Agency chose to resist disclosure. For example, many of the action memoranda, the basis on which the EPA Administrator takes final action, have been released, either as a matter of unofficial Agency policy or by individual employees who were not told to withhold such documents.

EPA should therefore set policies to establish which internal memoranda it will disclose. While nondisclosure of action memoranda may be justified under the spirit of the FOIA, other intraagency memoranda, such as any formal policy analysis, and interagency memoranda, such as the comments by other agencies on EPA's proposed regulations, should be part of the public record of the decision.

Finally, EPA should establish explicit policy guidelines for public access to the operations and reports of its advisory committees, in the spirit of the Federal Advisory Committee Act.

The role of advisory committees in the decision-making process has been increasing both under Congressional directives and EPA initiative. (For further discussion of advisory groups see Chapter 3, Section C.) Under the FACA, EPA must charter its advisory committees and provide for meetings to be announced beforehand and, with limited exception, to be open to the public. EPA has both statutory advisory groups, established to advise EPA on technical and policy issues, and the Agency-organized Science Advisory Board to advise the Administrator on scientific and technical issues. EPA has performed its obligations under FACA with the possible exception of its handling of ad hoc committees. The SAB administers several standing advisory committees but generally works through ad hoc groups. These groups are not organized under FACA, because EPA believes that there is a need to be able to organize groups quickly for advice. EPA also views the role of the ad hoc group as fact finding, to be reported openly to the SAB which in turn advises EPA. These ad hoc groups are permitted to operate in closed meetings. This situation has not yet caused major problems; it may, however, be more difficult to justify closed meetings of ad hoc groups of fact finders than of the full advisory committee since some ad hoc group reports have even contained explicit recommendations. The closing of any advisory meetings allows an agency (or, at the very least, gives the appearance of allowing an agency) to bury an advisory report or to influence the final draft. This potential problem could be avoided by either opening the meetings of ad hoc groups or, if closed meetings still appear legal and justified, by EPA's development of an explicit policy to make all minutes, records, and proposed reports from ad hoc groups publicly available.

While EPA has been accused of occasional instances of unjustified secrecy, the Agency enjoys an enviable reputation for candor. EPA, however, can go further in opening its decision-making processes to public scrutiny and by so doing both improve the process and increase the credibility of its decisions.

H. INTERAGENCY REVIEW

The requirement that proposed and final EPA regulations be circulated for formal review to other federal agencies and the Office of Management and Budget (OMB) prior to publication has had a positive effect on the

Agency's decisions. Environmentalists have expressed concern that the reviews may lead to undue influence by those who emphasize national goals that conflict with environmental improvement. Although experience in a few cases has supported this concern, it is overshadowed by the improved EPA analysis of the consequences of its actions that has resulted, at least in part, from the review process. Interagency review can, however, unnecessarily delay the promulgation of EPA rules.

- *For proposed rules, present procedures for interagency review should be retained, except that they should be conducted concurrently with public notice-and-comment procedures rather than preceding them. Interagency review of final regulations should be greatly expedited. Some of the time saved by these changes should be used to extend the period for outside comments on proposed rules and to introduce a short period for submission of replies to the first round of comments.*

The prescribed procedural change would allow extension of the review-and-comment period both for the interested executive agencies and for private parties without lengthening the total duration of the decision process.

* * *

THE REVIEW PROCEDURE

Interagency review of EPA regulations has been the source of some controversy, and many environmentalists see it as an open invitation to political interference with Agency decision making. Such concerns are exaggerated and perhaps result from incomplete understanding of how the review process actually works.

Like all administrative agencies, EPA participates in several forms of policy coordination within the Executive Branch. (For a description of Executive Branch interaction see Quarles [1976]. Chapters 5 and 7 discuss the interagency review process.) Interaction with the Domestic Council on the implementation of national priorities, negotiation of annual budgets with OMB, dependence on White House guidance for key agency appointments, mutual accommodation with other federal agencies in areas of shared responsibility, and participation in cabinet-level discussions are all means of assuring consistency in an Administration's programs. In addition to these conventional mechanisms for coordination, EPA alone is also subject to interagency review (informally known as the "quality of life" review) of its regulations. This review makes individual EPA regulatory decisions available for comment by other agencies and OMB examiners before they are published.

In the first months of EPA's existence, Administrator Ruckelshaus was informed by OMB Director George P. Shultz that, because EPA was providing "insufficient information on specific benefits of proposed environmental regulations" and was exhibiting "incomplete understanding and consideration of *full* costs to the Federal Government and other sectors," special OMB review and clearance was required before public announcement of EPA actions.[2] Shultz specified that such clearance would be mandatory for all EPA decisions that: (a) affect the policies of other federal agencies, (b) impose "significant costs on or negative benefits to non-federal sectors," or (c) create additional demands on the federal budget.

A few months later, Shultz broadened the requirement to cover all federal policy proposals involving consumer protection, public health and safety, and occupational health and safety, as well as environmental protection (U.S. OMB 1971). In practice, however, only EPA has seen its regulations routinely sent through interagency review. Two explanations for EPA's special treatment have been advanced: that EPA's rules normally have more pervasive economic impact than the other areas covered in the Shultz memo, and that examiners in OMB's environmental branch simply find the process more useful than those in other branches.

Citing the lengthy delays imposed by the procedure, EPA eventually persuaded OMB to relinquish responsibility for mechanical aspects of interagency clearance, including distribution of drafts, checking progress, and arranging discussion meetings when necessary, and Agency officials make no secret of their desire to dispense with the review process altogether. Recent reviews have still, however, followed the basic steps that were established by the original Shultz initiative.

Interagency review is required before publication in the *Federal Register* of both proposed and final regulations. When EPA feels that the Shultz criteria do not apply, it can request OMB to waive the review requirement, but at present nearly all of the actions cleared by the EPA Steering Committee are next circulated to those federal agencies known to have interest or expertise in the subject of the new rule.[3] All items are

[2] Letter from OMB Director George P. Shultz to EPA Administrator William D. Ruckelshaus, 21 May 1971.

[3] According to Agency tabulations for the Fiscal Year 1976, 54 of 59 proposed and final regulations developed under Steering Committee procedures were distributed to other agencies for review, and 58 of 59 required formal OMB clearance prior to publication.

routinely sent to the Department of Commerce which has an office specifically dedicated to review of environmental policy and which submits comments for over half of of the items it receives. Other agencies that have submitted comments for 20 percent or more of all the items subjected to interagency review include (in order) the Departments of Health, Education, and Welfare; Transportation; Interior; Agriculture; Defense; and the General Services Administration. Over 30 federal agencies have commented on EPA regulations in the last two years. About three agencies typically respond to a draft regulation.

Agencies are asked to reply within three weeks. When agency comments have been received and considered, the EPA office responsible for the regulation prepares written responses for review by one of the five OMB hearing examiners. OMB is asked to decide within two weeks whether to clear the regulation for *Federal Register* publication. EPA estimates that for about one-half of all regulations reviewed, agency comments are only technical and no basic policy differences are reflected. In about half of the cases where such policy disputes occur, OMB and EPA may decide to convene a meeting at OMB with the protesting agency. Occasionally a contested issue has been referred to the Domestic Council for review.

Aware of widespread suspicion about the extent of their influence on EPA policies, OMB examiners stress that their role in interagency review is predominantly that of mediators, not judges; their own preferences are strictly limited to the need for fiscal responsibility and technically sound regulations, and the former concern is rarely at issue in a particular EPA regulation. OMB cannot legally block publication over the objection of the EPA Administrator, and, on rare occasions, notices have in fact been published without final resolution of interagency differences and ultimate OMB clearance.

Upon publication of a proposed rule, comments are received from the public, and EPA prepares a final version, which, in almost all cases, also requires interagency review. At this stage responding agencies rarely comment on technical details in EPA's analysis; most criticism relates to differences in policy.

INTERAGENCY REVIEW AND EPA DECISION MAKING

The primary benefit of interagency review has been improvement of the technical quality of EPA decisions. Anticipation of formal review of its intended actions by interested experts in other agencies has been a strong inducement for EPA to assemble the best available information and analysis of the actual consequences of environmental decisions. Some ascribe the institution of EPA's elaborate internal review procedures (U.S. EPA 1977, also see Appendix C) to the Agency's interest in producing regulations that will withstand critical review by agencies with different and sometimes conflicting missions.

Most of those familiar with EPA decisions agree that there has been a dramatic improvement in the technical quality of the Agency's analysis in recent years, and some have claimed that EPA's analytical capability is among the best in government. Factors other than interagency review have, of course, also contributed to this improvement; at least as important as the review of other agencies are the demands of reviewing courts for clearly reasoned decisions, the Agency's growing organizational maturity, and its increasing liberation from the stringent statutory deadlines for action. Interagency review, however, remains valuable, partly because it encourages EPA to secure early involvement of experts from other agencies in EPA rule making, thus extending its information resources and analytic capacity.

Critics of interagency review cite two drawbacks. One is the danger that, because commenting agencies almost uniformly value other national policy objectives over environmental goals, proposals subsequently presented to the public will tend to be environmentally weakened, and public debate will thus be unduly narrowed. This fear is fueled by the fact that interagency review has often uncovered policy conflicts between EPA and other agencies (most commonly the Department of Commerce), and by the supposition that a Republican President's budget office would favor the businessman's viewpoint over the environmentalist's. In fact, however, interagency reviews have not often been an independent source of direct political influence on EPA rule making. OMB itself possesses no ultimate power of veto, and it is because EPA can invoke its authority to publish items without formal OMB clearance that a former EPA official concluded that "we won every battle we fought."[4] As with all line agencies, EPA's actions are accountable to the President and may be subject to objections when it is felt that non-environmental and environmental objectives have not been balanced correctly. Elimination of interagency review procedures alone would do little to alter the prospect of such intervention.

---

[4] Bach, S. (1976) Governmental Constraints on Environmental Regulation, p. 22; prepared for the Committee on Environmental Decision Making.

A second concern is with the delay that interagency review imposes on promulgation of EPA rules. While there appears to have been some recent improvement in this area and the procedures are flexible enough to allow expedited handling when necessary, informal EPA tabulations indicate that the two sequential reviews each consume about two months on average. Of this figure, OMB clearance consumes a median of 18 days at each stage, and one in five is held up for more than 50 days. These delays account for nearly a sixth of the total time required for development of the typical EPA regulation. As might be expected, there is some tendency for responding agencies to argue about proposed rules as if they were final, consequently prolonging debate on issues that could as easily be left to the public comment period.

RECOMMENDED CHANGES

Delays can be reduced by administering interagency reviews concurrently with public notice-and-comment procedures for proposed EPA rules. This reform would enable EPA to lengthen the specified period for agency comment, which the agencies now feel to be inadequate, to at least 60 days, while still effecting a net reduction in the time required to reach well-informed decisions.

The ostensible reason for requiring completion of interagency review before publication of proposed rules is to assure that the proposal accurately represents the Executive Branch position (assurance that is lacking for the proposed rules of other agencies) and that technically inept proposals are not exposed to public scrutiny. This rationale may have been valid in the past, but is weakened by the Agency's laudable present plans to further open decision making to outside parties at the early stages of policy formulation. In particular, such new EPA measures as the regular use of the Advance Notice of Proposed Rulemaking and the periodic publication of lists of all EPA rules in formulation will give interested nongovernmental groups full opportunity to follow the development of new rules from their birth. The diverse policy positions of interested executive agencies and any technical weaknesses in the analysis will, in effect, be public information, and the relative importance of the Notice of Proposed Rulemaking will diminish accordingly.

For final regulations, prepublication interagency review should normally consume no more than three weeks for both agency review and the associated OMB clearance. Since objections at this stage are generally political rather than technical, responding agencies rarely require time for fact finding and analysis. The imposition of shorter deadlines therefore will not affect the quality of analysis for EPA decisions; it will, however, expedite the publication of uncontested regulations and will encourage prompt attention to those issues requiring resolution of policy differences within the Administration.

While it would further reduce delays, the outright elimination of interagency review for final regulations is not warranted. Retention of the review requirement assures that the comments of other agencies are not cavalierly dismissed by EPA. In addition, since EPA is not an independent agency, some form of final political clearance is unavoidable, and it is preferable that an opportunity to exercise this final control come at a stage when issues have already been illuminated by public debate.

Adoption of the recommended measures would, theoretically, reduce the gestation phase of draft EPA rules by about 12 weeks; in practice the time saving would be less, but still would be significant. Some of the time saved should be used to lengthen periods for submission of comments by public agencies and private parties and to institute a two-week period for the submission of reply comments beginning immediately after outside comments are filed. Extension of the comment period will provide more opportunity for commenters to gather empirical information and perform analyses in support of the position they advocate, and thus improve the quality of public discourse. Both private and public commenters have expressed a preference for longer comment periods. The introduction of a reply comment period, which has been used successfully in other agencies, would allow all commenters to subject opposing parties' analyses to critical review. The reply comments, like cross-examination in adjudication, provide an opportunity to rebut the claims made by adversaries in the initial round of comments, and can thus acquaint EPA with factual and logical weaknesses in partisan assessments of alternative policies.

I. JUDICIAL REVIEW

Judicial review of EPA's administrative actions has played a major role in shaping and improving the Agency's decision-making process. The judicial review process has impeded EPA's programs only when federal courts have given conflicting interpretations to statutes intended to be administered uniformly throughout the country.

- *The current structure and standards for judicial review should be maintained with the exception that legislative changes should be made to provide that certain EPA decisions that apply uniformly over the nation be reviewed only in the U.S. Court of Appeals for the District of Columbia.*

* * *

FUNCTIONS OF JUDICIAL REVIEW

The federal courts have often been called upon to review EPA actions, forcing the Agency to act when it has been slow to carry out its responsibility; clarifying and interpreting the statutory language; shaping the procedures of the Agency to guarantee fairness; and reviewing EPA's decisions to ensure that those decisions are based on relevant factors and are not clearly erroneous. In performing their function, the courts have recognized the complex nature of EPA's decisions and have tended to assist the Agency in developing effective and fair decision-making processes. However, owing to the decentralized structure and vague statutory guidance for judicial review, the courts have at times given EPA inconsistent directives. Conflicting interpretations by federal courts in different areas of the country prevent uniform application of the laws. The problem created by differing interpretations of statutory provisions could be reduced by providing that certain decisions be reviewed in the Court of Appeals for the District of Columbia rather than in any or all of the federal Courts of Appeal.

Although the large number of cases requiring judicial review of EPA activities has made it appear that the courts have a special role in EPA decisions, review of EPA's actions by the courts has generally served the same purposes as does review of decisions of other regulatory agencies. Judicial review of EPA decisions can be classified in three distinct groups: "constraint enforcing," "law clarifying," and "decision checking." Often a single case will involve more than one of these functions.

The "constraint enforcing" function of judicial review is the one instance in which the courts play a somewhat special role with respect to EPA actions. When Congress enacted the current pollution control statutes, it was clearly concerned with correcting a pattern of administrative laxity in implementing previous legislation. The coupling of detailed legislative mandates and specific deadlines with a liberal citizen suit authorization was provided in the laws to constrain the discretion of the Agency. The courts have generally responded with straightforward enforcement of the legislative directives but with a recognition of the time and resource requirements for sound decision making. (For a discussion of deadlines and the citizen suit see Chapter 3, Section F.)

The "law clarifying" function of judicial review is invoked frequently to resolve issues of statutory interpretation in those cases in which legislative guidance is incomplete or vague. Federal courts have reviewed EPA's interpretations of statutory provisions (such as the requirement to enforce a non-degradation policy under the Clean Air Act [*Sierra Club* v. *Ruckelshaus* 1972], the definition of "adequately demonstrated" technology under the Clean Air Act [*Essex Chemical Corporation* v. *Ruckelshaus* 1973], the authority to issue single number effluent limitations under the Federal Water Pollution Control Act [*E.I. du Pont de Nemours & Company* v. *Train* 1976], and the requirement under the Federal Environmental Pesticide Control Act that EPA issue a notice of cancellation whenever the Agency has found that use of a pesticide raises a "substantial question of safety" [*Environmental Defense Fund* v. *Ruckelshaus* 1971]). The courts tend to defer to an agency's expertise when the agency presents a sound interpretation of an ambiguous directive, but will sometimes overturn an agency's interpretation, as EPA has discovered. Generally, "law clarifying" by the courts has resolved questions of Congressional intent in ways that enhance the effectiveness of EPA's regulatory programs.

The "decision checking" function of judicial review involves courts in testing the correctness of discretionary decisions made by administrative agencies. Suits can be brought against regulatory agencies to review alleged procedural and substantive errors in agency decisions. The courts' exercise of their powers to review procedural aspects has generally promoted establishment of an administrative process in which decisions are based on facts clearly in evidence and on policies that are fully articulated. The effect has been that procedures for decision making have been tailored by the courts and EPA to the particular types of action to be taken in the time provided. (For a discussion of the courts' role in shaping EPA procedures see Chapter 4, Section G.)

When reviewing the substantive aspects of the agencies' decisions, courts "consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error in judgment. Although the inquiry into the facts is to be searching and careful, the ultimate standard of review is a narrow one. The court is not empowered to substitute its judgment for that of the agency" (*Citizens to Preserve Overton Park, Inc.* v. *Volpe* 1971:416). Federal courts have required EPA to perform a reasoned analysis (*Essex Chemical Corporation* v. *Ruckelshaus* 1973:434 and *American Meat Institute* v. *EPA* 1975) and to gather a sufficient data base (*FMC Corp.* v. *Train* 1976) for setting an air and water pollution standard or regulation. When the information and analysis are in the records, as they were for EPA's pesticide cancellation and suspension decisions (*Environmental Defense Fund* v. *EPA* 1973, 1975, 1976), the courts have deferred to the Agency's expertise and upheld the decisions.

In exercising the limited power of judicial review, the courts have generally fulfilled the three functions of review in ways that ensure that EPA performs its duties in a timely fashion, that interpretations of the law are reasonable and allow the Agency to carry out the intent of Congress, and that EPA decisions reflect procedural fairness and a rational decision-making process. Despite claims that either the industrial proponents or the environmental proponents have benefited exclusively from judicial review, it appears that the review process has not systematically favored one group of litigants over another.[5]

EXPERIENCE WITH DECENTRALIZATION OF JUDICIAL REVIEW

The statutes governing the review, however, have not always been clearly and consistently designed and have occasionally impeded the rapid and uniform administration and enforcement of certain environmental protection programs. In particular, several statutes are unclear about which court or courts are authorized to review EPA decisions, and some statutes allow EPA decisions to be reviewed in a number of courts simultaneously. Review by a number of courts of an administrative action that Congress intended to be implemented quickly and uniformly can result in delay and confusion if the different courts interpret the law differently.

The Federal Water Pollution Control Act (FWPCA), the Toxic Substances Control Act, and the Federal Environmental Pesticides Control Act (FEPCA) provide for judicial review of decisions in the Court of Appeals in the jurisdiction where the party seeking review resides or transacts business, and thus permit potentially conflicting interpretations. The Clean Air Act (CAA), the Noise Control Act, and the Safe Drinking Water Act (SDWA) provide that certain decisions that "are national in scope and require even consistent national application" (U.S. Congress, Senate 1970:41) be reviewed only in the Court of Appeals for the District of Columbia; similarly under the recent Resource

---

[5] Hines, N.W. (1976) Judicial Review of EPA Decision Making; prepared for the Committee on Environmental Decision Making.

Conservation and Recovery Act of 1976, (PL 94-580 1976, Section 7006), all of EPA's regulations on solid waste are subject to review only in the D.C. Court of Appeals. In the CAA and SDWA, all other decisions are to be reviewed in the "appropriate" Court of Appeals. Therefore, under the CAA, review of ambient air quality standards, regulations dealing with motor vehicle fuels and fuel additives, and several other actions that are to be uniformly implemented will always be reviewed by a single appellate court, while under the FWPCA, issues relating to the formulation of uniform national policy can be and have been reviewed, with varying results, in a number of Courts of Appeals. Only a decision by the Supreme Court can resolve the conflicting judicial interpretations of the Courts of Appeals, and until the Supreme Court rules EPA cannot implement programs with national uniformity.

The most obvious example of the problem of conflicting judicial directives came about as a result of a disagreement over the authority that the Federal Water Pollution Control Act gives to EPA in setting effluent limitations. Because of two vague and overlapping provisions in the Act, many industries have challenged EPA's decision to set single number guidelines for the maximum effluent discharge for all similar types of industrial plants rather than a range of values from which each plant's limitation can be chosen. Under its interpretation of the FWPCA, EPA has established single number values for almost all types of industries; however, upon review, a number of Courts of Appeals have disagreed on the interpretation of the law. Therefore, in certain areas of the nation, EPA's standards are not applicable to some sources of water pollution while in others they are, and a uniform framework of minimum standards cannot be implemented fully until the Supreme Court resolves the conflict (*E.I. du Pont de Nemours & Company* v. *Train* 1976).

Even under the Clean Air Act, where certain issues are only reviewable in the Court of Appeals for the District of Columbia, some decisions that are national in scope are subject to the same problem of conflicting decisions in several courts. The Act provides for review of many decisions in the "appropriate" Court of Appeals. Some courts have interpreted the Act and the legislative history to require that the "appropriate" court be the court in the area of the country where the party resides or transacts business. Thus parties in different parts of the country can seek review of an EPA decision in different courts. Other courts have interpreted "appropriate" differently and have held that review of EPA actions that apply uniformly to all states should occur in the Court of Appeals for the District of Columbia.

A classic illustration of the problem of conflicting judicial opinions is the question of whether EPA is allowed to consider technological and economic feasibility in reviewing the adequacy of the state implementation plans for controlling air pollution. Of the five appellate courts examining the issue, no two courts interpreted the law and legislative history in the same way. The Supreme Court finally resolved the conflict (*Union Electric Co.* v. *EPA* 1975). Similarly, EPA's decision to extend the deadline for achieving certain air quality standards in all states was challenged simultaneously in all eleven federal appellate courts (*Natural Resources Defense Council* v. *EPA* 1973). In both of these situations and in many others the regulations and the standards at issue before the courts would apply uniformly over the nation. To try to resolve the issue in a number of "appropriate" courts at the same time can be a waste of resources and time.

EPA is not the only agency whose national decisions need to be reviewed in a single court. Certain Federal Communications Commission (47 USC 402[b] 1970) decisions are subject to judicial review only in the D.C. Court of Appeals (Currie and Goodman 1975:62). Congressional concern for national uniformity and rapid resolution of conflicts justifies this process. For certain other federal activities, Congress has established specialized courts of review, such as the tax and patent courts. The question of an environmental court has been examined extensively in the literature (U.S. Congress, House 1972:143; Hines and Nathanson 1973; U.S. Department of Justice 1973; Whitney 1973), but there has been no agreement that such a court would be justified. The D.C. Court of Appeals has both the expertise in reviewing administrative decisions and the broad perspectives that enable it to evaluate the range of issues involved in environmental cases.

SUGGESTED REFORMS

To avoid the problems discussed above, statutes should be reformed to clarify and make consistent the various judicial review provisions of the environmental laws. Centralized judicial review in the Court of Appeals for the District of Columbia of any decision that applies uniformly over the nation would avoid duplicative litigation, hasten final resolutions of conflict, and preclude litigants from seeking the most sympathetic of the Courts of Appeals. The reform, however, should avoid overloading the single Court of Appeals. Decisions that do not apply uniformly should continue to be reviewed in the decentralized court system. Diversity of views has its benefits, the centralized court must not be overburdened, and local issues should be decided where litigants have easy access to the court and where local conditions will be understood by the court.

Clarification of language such as "appropriate court," together with the use of the Court of Appeals for the District of Columbia to review such decisions as setting regulations for state air or water pollution programs and federal registration and labeling of pesticides and toxic substances, would facilitate judicial review of EPA's decisions and thus implementation of the environmental laws. Thus modified, judicial review will continue to benefit EPA's decision-making process by clarifying the statutes, enforcing Congressional constraints, and defining the scope of EPA's discretion without greatly delaying the implementation of the laws.

J. PUBLIC PARTICIPATION

Citizen organizations have played a significant role in EPA's development and implementation of environmental policy. However, the extent of their involvement is limited by the amount of funds available for public participation in EPA and judicial proceedings.

- *EPA, perhaps through an impartial body, should provide some of the financial support of groups or individuals who can contribute to rule making or adjudicatory proceedings by raising new issues or by submitting additional assessments or analyses of relevant issues. To gain an understanding of difficulties of implementation, the Agency should experiment with means for providing such support.*

Determination of eligibility and amount of award should be based upon an applicants' demonstration of potential contribution to the proceedings (that would not otherwise be made by other participants) and of financial need. EPA should allocate a fixed sum for a public participation program that reflects the general experience with contributions of citizen groups.

In addition to this program of participation in administrative proceedings before EPA, court fee awards should be extended to all types of environmental litigation by statutory change where necessary. Existing statutory citizen suit provisions should be expanded by enacting for each EPA statute a uniform provision to deal with all aspects of suits initiated by citizens.

EPA's current means of awarding grants and contracts should be used to a greater extent to solicit or sponsor citizen group research and public education relevant to regulatory issues.

* * *

Good decision making in administrative and regulatory agencies and in the courts requires assurance that all aspects of the public interest are articulated. The illumination of all aspects of a policy question invigorates policy debates and has the effect of raising new issues or areas of concern. Yet, interests often go unrepresented, in part because the costs or benefits of a decision to segments of the public are not clear and in part because funds to enable meaningful participation are not available.

Despite their limited funds, citizen organizations—primarily national nonprofit membership organizations such as the Environmental Defense Fund, the Natural Resources Defense Council, the League of Women Voters, and the Sierra Club—have had a significant impact on EPA's development and implementation of environmental policy. Such groups have frequently participated in EPA decision-making procedures, focusing attention on neglected environmental problems, supplying information and views on policy choices, and monitoring EPA's discharge of its responsibilities. In addition, many of these groups have instituted lawsuits challenging EPA's programs as inadequate or otherwise violative of EPA's statutes. Congress provided under Section 101e of the Federal Water Pollution Control Act Amendments of 1972 that public participation should be "provided for, encouraged, and assisted" by EPA (33 USC 1251 1975, Ragan et al. 1975). In addition, Congress clearly contemplated an active "watchdog" role of this kind for the public because it provided explicitly for citizen suits in most of the statutes administered by EPA.

Participation by the general public and organized citizen groups, though substantial, has been far less extensive than that of industry in part because public participants have smaller resources (Council for Public Interest Law 1976). Environmental groups are dependent largely on voluntary contributions from members and donations by foundations, but continuation of foundation funding is uncertain. It has been argued that one should expect citizen group involvement to be less extensive than that of regulated parties on the grounds that EPA itself is charged with protecting the public interest and thus, to the extent that the Agency performs this function adequately, there is no need for a precise balance of influence between industrial and environmental groups in Agency proceedings. While it is true that in the exercise of some of its duties the Agency does act strictly as a promoter of environmental interests (for example, in its review of environmental impact statements prepared by other agencies), it is also true that EPA often takes a more neutral role in balancing various aspects of the public interest. (It should be noted that many of the previous recommendations of this report, particularly those dealing with analyses in support of decision making, would have the effect of emphasizing a neutral, balancing role for EPA.) The Subcommittee on Administrative Practice and Procedure of the Senate Committee on the Judiciary has stated that agencies do not fully protect the public interest largely because of "widespread confusion over the interrelationship between their dual functions as advocates for and judges of the public interest" (U.S. Congress, Senate 1976:8). The Subcommittee noted, in addition, that the contention

> that agency determinations may not always be based upon adequate consideration of the public's interests is also confirmed by the increasing frequency with which courts feel compelled to reverse agency actions for failure to give all interested persons an opportunity to participate (U.S. Congress, Senate 1976:9).

PUBLIC PARTICIPATION IN JUDICIAL PROCEEDINGS

In recent years the courts have expanded the rights of citizens to participate in judicial review of Agency decisions. But the relaxation of the rules of standing, while providing encouragement to citizen groups to participate, has been insufficient, in itself, to increase public participation significantly because the costs of such participation are often too great. Against a background of judicial expansion of the right to court review, Congress added to the environmental legislation (with the notable exception of the Federal Environmental Pesticides Control Act of 1972 [FEPCA] [7 USC 136 1975]) provisions for citizen suits. The rationale was to enlist the energies of environmental litigants and reviewing courts to correct administrative laxity in carrying out the substantive directives of the laws. While the associated right of environmental interests to participate in formal EPA proceedings is not specifically dealt with in EPA statutes, many of the laws provide for "public hearings" or opportunities for comment by interested persons before proposed action is taken.

The courts have addressed the problems of financial recompense of citizen groups for the expenses of litigation. The general "American rule" is that each party must bear its own litigation expenses, but the lower federal courts began to develop an exception to this rule in environmental litigation, using a "private attorney general" rationale. Under this rationale, plaintiffs who successfully challenged governmental policies as contrary to statute were entitled to an award of attorney's fees because they had vindicated important public interests and ensured compliance with policies mandated in Congressional statutes. However, in 1974 the

Supreme Court held that a Congressional statute dealing with cost awards in federal court litigation prevented judicial development of this exception to the "American Rule" (*Alyeska Pipeline Service Co.* v. *The Wilderness Society* 1975). The court also held that another Congressional statute precluded the award of attorney's fees against the United States, and rejected as inequitable lower federal court practices of awarding plaintiffs' fees against private party defendants who stood to benefit from the government's unlawful conduct. The decision eliminated, for all practical purposes, court awards of attorney fees in environmental cases where there is no specific statute authorizing such awards. Although a number of the laws administered by EPA authorize awards of attorney fees for participation in judicial review, some like FEPCA, do not. The recommendation provides for reinstating the ability of the public to recover costs of litigation.

PUBLIC PARTICIPATION IN AGENCY PROCEEDINGS

The recommendation in this section, if put into effect, would encourage greater public involvement in Agency proceedings as well as in judicial review. It should be noted that the recommendation would permit certain groups, such as labor organizations or small business groups, to qualify for needed funds. The participation of environmental groups in Agency proceedings has often been hampered by the inability of the groups to retain experts who are familiar with the details of technical issues involved. While this handicap is in part attributable to the fact that often such experts are directly or indirectly associated with industry, the limited financial resources of environmental groups have also been an important factor.

The participation of citizen groups can add, and has added, to the quality of Agency decision making by raising new issues, by inserting new or different assessments and analyses of relevant issues into the decision-making process, and on occasion, by presenting new information (such as the discovery of certain contaminants in drinking water).

It has been claimed that, because of limited resources, citizen groups often have an incentive to participate in cases that they feel reasonably certain they can win, or that will generate significant publicity, rather than in those that may have major environmental or social impact. Our discussions with representatives of citizens groups confirm this. If, in contrast, sufficient resources were to be made available, the groups would be more likely to enter cases on the basis of national or local importance and to assure a better balance of arguments in those cases.

The recently enacted Toxic Substances Control Act (PL 94-469, 1976) provides (in Section 6[c][4]) that

> The Administrator may . . . provide compensation for reasonable attorney's fees, expert witness fees, and other costs of participating in a rulemaking proceeding for the promulgation of a rule (for the regulation of hazardous chemical substances and mixtures) . . . .

To receive funds, a person must "represent an interest which would substantially contribute to a fair determination of the issues" and must either have an "economic interest [that] . . . is small in comparison to the costs of effective participation" or be able to show that he or she "does not have sufficient resources adequately to participate in the proceeding without compensation . . . " (PL 94-469, 1976). In making determinations about eligibility, the Administrator is to take into account the number and complexity of the issues involved and the financial burden that would be incurred. Up to 25 percent of the funds paid as compensation under this section of the Act can be paid to parties that would be regulated by the proposed rule. This provision of the Toxic Substances Control Act has not yet been applied, but it is consistent with the spirit of the Committee's recommendation.

The experience of other government agencies with the funding of public participants in agency proceedings is quite limited and has, for the most part, taken the form of abstract discussions of the issues rather than actual funding of participants.

The Magnuson-Moss Product Warranty and FTC Improvement Act of 1975 (15 USC 57a[h] Supp. 1976) includes a provision that authorizes the Federal Trade Commission to provide compensation for costs of attorney's and expert witnesses' fees and other costs of participation to any party

> (A) who has, or represents an interest (i) which would not otherwise be adequately represented in such proceedings and (ii) representation of which is necessary for a fair determination of the rule-making proceeding taken as a whole, and (B) who is unable effectively to participate in such proceeding because such person cannot afford to pay costs of making oral presentations, conducting cross examination, and making rebuttal submissions in such proceeding.

Congress appropriated $500,000 for funding public participation.

The Nuclear Regulatory Commission recently has been debating the question of financing intervenors in commission proceedings. A report on major issues in the provision of funds to public participants was prepared (Boasberg, Hewes, Klores and Kass 1975) and Congress has considered legislation that would provide specific statutory authority for awards of fees and costs (Council for Public Interest Law 1976). In fact, it is not clear that such legislation is necessary; a recent opinion of the

Comptroller General held that the Nuclear Regulatory Commission already has authority to fund citizen participation (Comptroller General's Decision February 1976). (A second Comptroller General opinion extends this decision to EPA and other regulatory agencies [Comptroller General's Decision May 1976].) Despite the opinion, the Commission has decided not to provide funds to citizen groups (except in one rule-making proceeding) and has asked for additional Congressional clarification of its authority (U.S. NRC 1976).

POTENTIAL DISADVANTAGES OF FUNDING PUBLIC PARTICIPATION

Although the funding of public participation in Agency proceedings would produce the benefits discussed earlier, the recommendation is not without its difficulties. There is the possibility of a delay in the proceedings due to the increased time necessary to consider the views of the larger number of participants. In fact, however, the experience of other agencies provides little support for this argument, except in isolated instances. James V. Delong, Assistant Director for Special Projects, Bureau of Consumer Protection, Federal Trade Commission, stated recently that the FTC program "has not produced undue delay in proceedings or, so far as we can tell, lengthened them in any fashion" (Delong 1976:27). In the case of nuclear power plant licensing proceedings, AEC hearing board examiner Arthur Murphy noted that "although the time spent in the licensing process is significant, there is, at present, little evidence that public participation in the process has been a major factor contributing to delays" (Murphy 1972:994). In fact, time for public participation is currently allotted in many Agency proceedings; funding of public participation would not produce any delay in these cases.

A potential problem that has been suggested is that some applicants might be "fronts" for affected industries. This is quite possible; but if, when it occurs, those applicants can demonstrate a potential original contribution to the proceeding and make a showing of need, their participation should be encouraged as much as that of environmental groups. As we have seen, both the Toxic Substances Control Act and the FTC authorization permit up to 25 percent of public participation funds to be used to compensate persons who would be regulated by a proposed rule. (As of June 4, 1976, only 1 of 54 applications to the FTC had been from an industrial organization [Delong 1976:40].)

The possibility exists that EPA funding of citizen groups will compromise one of their most valuable attributes—their independence. The use of an impartial body to decide upon eligibility for funding could provide some insulation between EPA and citizen groups. In addition, citizen groups have begun to petition for public funding mechanisms[6] without any apparent fear of being co-opted. However, the possibility of co-optation (or the appearance of co-optation) remains real and must be guarded against.

In addition, if citizens played a more active role, EPA might tend to permit them to carry the burden of expressing the public interest or of suggesting controversial policies while the Agency relaxed or took a more neutral stance.

FUNDING CITIZEN GROUPS

Perhaps the most controversial of the issues involved in funding of public participation is whether or not funds (or the assurance of reimbursement) should be made available in advance of participation. Deciding to provide funds before a proceeding would have the effect of encouraging participation by a wider range of interests. If funds are available only after participation, some groups that might be able to make significant contributions to a proceeding may be inhibited from taking part because they cannot afford to take the risk of not being reimbursed. The effect would be to encourage participation only by those groups with sufficient resources to bear the risk. On the other hand, without prepayment (or the promise of funds) the Agency would be assured of paying only for actual contributions and would avoid the risk of promising funds to groups or individuals that might not play an important role.

The report prepared for the Nuclear Regulatory Commission (Boasberg, Hewes, Klores and Kass 1975) commented on this matter:

> Waiting until the conclusion of proceedings may work a particular hardship on under-financed local citizen groups, and favor the larger national organizations. The latter may be better able to withstand an immediate drain on their resources, if they know they can recoup their costs at the hearing's end.

Requiring a decision about funding before the start of proceedings could lead to problems of determining eligibility for funding and to the possibility that choices would have to be made among a large number of parties seeking support in any given case. Awards and determination of eligibility for awards could be made by an impartial body that could encourage consolidation of identical or similar interests, but choices among applicants would remain difficult. To the extent that previous performance by applicants for funds played a role in decisions on

[6] Environmental Defense Fund, Consumers Union, and Center for Auto Safety (1976) Citizen Petition to the Environmental Protection Agency. (Xerox available from the Center for Auto Safety.)

allocation of funds, public interest groups would have an incentive to make their contributions significant and there would be less chance that frivolous interventions would be funded.

SUMMARY

On balance, the Committee feels that the benefits of more active citizen participation that would result from the implementation of the recommendation outweigh the potential disadvantages. The method for providing funds to groups is not specified here, partly because of disagreement among Committee members about the most appropriate method, and, partly, because many Committee members were convinced that experimentation would lead the Agency to the most effective method.

Among methods that might be tried are preparticipation awards in the form of grants, matching funds, or contracts for programmatic participation. Alternatively, the statutes could be amended to permit individuals or groups to petition the courts for fees to cover involvement in EPA adjudicatory and rule-making procedures (even if the outcome of such procedures were not appealed to the courts).

The Committee's recommendation calls for the continuation and expansion of EPA's program of providing grants and contracts to qualified citizen groups and other organizations for public education and research. EPA has, in the past, provided funds to such organizations as the Conservation Foundation, the League of Women Voters, the American Lung Association, the National Wildlife Federation, the Sierra Club, and others to undertake projects that would enhance public understanding of environmental problems and programs and encourage or facilitate public participation in environmental planning and decision making. Such projects have helped to raise the level of public awareness about environmental issues and should be continued.

REFERENCES

Alyeska Pipeline Service Co. v. *Wilderness Society* (1975) 421 US 240.

American Meat Institute v. *EPA* (1975) 526 F 2d. 442 (7th Cir.).

Associated Industries v. *United States Department of Labor* (1973) 487 F 2d 342 (2nd Cir.).

Boasberg, Hewes, Klores and Kass (1975) Policy Issues Raised by Intervenor Requests for Financial Assistance in NRC Proceedings. Report to the Nuclear Regulatory Commission. NUREG-75/071. Washington, D.C.: U.S. Nuclear Regulatory Commission; PB 243 660/8GA, Springfield, Va.: National Technical Information Service.

Citizens to Preserve Overton Park, Inc. v. *Volpe* (1971) 401 U.S. 402.

Comptroller General's Decision B-92288 February 19, 1976.

Comptroller General's Decision B-180224 May 10, 1976.

Council for Public Interest Law (1976) Balancing the Scales of Justice: Financing Public Interest Law in America. Washington, D.C.: Council for Public Interest Law.

Currie, D.P. and F.I. Goodman (1975) Judicial review of federal administrative action: Quest for the optimum forum. Columbia Law Review 75(1):1-88.

Davis, K.C. (1972) Administrative Law Text 3d ed. St. Paul, Minn.: West Publishing Company.

Delong, J.V. (1976) Testimony. Pages 27-43, Public Participation in Government Proceedings Act of 1976. Hearings before the Committee on Government Operations, United States Congress, Senate, on S. 2715. 94th Congress, 2nd Session.

E.I. duPont de Nemours & Company v. *Train* (1976). 541 F 2d 1018, (4th Cir.) cert. granted 44 U.S. Law Week (1976) 3738, aff'd in part and reversed in part 45 U.S. Law Week (1977) 4212 (Sup. Ct.).

Environmental Defense Fund v. *EPA* (1973) 489 F 2d 1247 (D.C. Cir.).

Environmental Defense Fund v. *EPA* (1975) 510 F 2d 1292 (D.C. Cir.).

Environmental Defense Fund v. *EPA* (1976) 45 U.S. Law Week 2270.

Environmental Defense Fund v. *Ruckelshaus* (1971) 439 F 2d 584 (D.C. Cir.).

Essex Chemical Corporation v. *Ruckelshaus* (1973) 486 F 2d 427 (D.C. Cir.).

FMC Corp. v. *Train* (1976) 8 Environment Reporter—Cases 1731 (4th Cir.).

Hines, N.W. and N.L. Nathanson (1973) Preliminary analysis of environmental court proposal suggested in the Federal Water Pollution Control Act Amendments of 1972. Analysis prepared for the Administrative Conference. Pages C/1-C/27, Report of the President, Acting Through the Attorney General, on the Feasibility of Establishing an Environmental Court System. Washington, D.C.: U.S. Department of Justice.

International Harvester Co. v. *Ruckelshaus* (1973) 478 F 2d 615 (D.C. Cir.).

Kennecott Copper Corp. v. *EPA* (1972) 462 F 2d 846 (D.C. Cir.).

Murphy, A.W. (1972) The National Environmental Policy Act and the licensing process: environmentalist Magna Carta or agency coup de grace. Columbia Law Review 72(6):963-1007.

National Park and Conservation Association v. *Morton* (1974) 498 F 2d 765 (D.C. Cir.).

Natural Resources Defense Council v. *EPA* (1973) 475 F 2d 968 (D.C. Cir.).

Pedersen, W.F., Jr. (1975) Formal records and informal rulemaking, Yale Law Journal 85(1):38-88.

Portland Cement Association v. *Ruckelshaus* (1973) 486 F 2d 375 (D.C. Cir.).

Quarles, J.R. (1976) Cleaning Up America: An Insider's View of the Environmental Protection Agency. Boston, Mass.: Houghton Mifflin.

Ragan, J.F., D.A. Aggerholm, J.J. Swift, and A. Widditsch (1975) Assessment of Public Participation in the Implementation of the Federal Water Pollution Control Act Amendments of 1972. Report to the National Commission on Water Quality. Washington, D.C.: National Commission on Water Quality.

Sierra Club v. *Ruckelshaus* (1972) 344 F Supp. 253 (D.D.C.) aff'd by an equally divided Supreme Court, *sub nom., Fri* v. *Sierra Club*, 412 U.S. 541 (1973).

Spector, P.L. (1976) Regulation of pesticides by the Environmental Protection Agency. Ecology Law Quarterly 5(2):229-263.

Stewart, R.B. (1975) The reformation of American administrative law. Harvard Law Review 88(8):1667-1813.

Union Electric Co. v. *EPA* (1975) 515 F 2d 206 (8th Cir.), aff'd 427 U.S. 246 (1976).

U.S. Congress, House (1972) Federal Water Pollution Control Act Amendments of 1972. House Report 92-911, Committee on Public Works, 92nd Congress, 2nd Session.

U.S. Congress, Senate (1970) National Air Quality Standards Act of 1970. Senate Report 91-1196, Committee on Public Works, 91st Congress, 2nd Session.

U.S. Congress, Senate (1976) Public Participation in Government Proceedings Act of 1976. Senate Report 94-863, Committee on the Judiciary, 94th Congress, 2nd Session.

U.S. Department of Justice (1973) Report of the President Acting Through the Attorney General on the Feasibility of Establishing an Environmental Court System. Washington, D.C.: U.S. Department of Justice.

U.S. Environmental Protection Agency (1976) 1975 Annual Report on Freedom of Information Activities. Freedom of Information Office, Executive Communications Division, Office of the Administrator, Washington, D.C.: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency (1977) Development of Regulations. Draft. Office of Planning and Evaluation. Washington, D.C.: U.S. Environmental Protection Agency.

U.S. Nuclear Regulatory Commission (1976) Financial assistance to participants in Commission proceedings: statements of consideration terminating rule making. 41 FR 50829.

U.S. Office of Management and Budget (1971) Agency Regulations, Standards, and Guidelines Pertaining to Environmental Quality, Consumer Protection, and Occupational and Public Health and Safety: Memorandum for the Heads of Departments and Agencies. Washington, D.C.:U.S. Office of Management and Budget.

Whitney, S.C. (1973) The case for creating a special environmental court system. William and Mary Law Review 14(3):473-522.

Williams, S.F. (1975) Hybrid rulemaking under the administrative procedures act: a legal and empirical analysis. University of Chicago Law Review 42(3):401-456.

Zener, R.V. (1976) Extent to Which FIFRA Section 10(b) Requires EPA to Afford Confidential Treatment to Test Data. Memo from R.V. Zener, General Counsel to Edwin L. Johnson, Deputy Assistant Administrator Pesticides Programs, March 5, 1976. Washington, D.C.: U.S. Environmental Protection Agency.

II DEVELOPMENT OF PROGRAM STRATEGIES

5 Procedures for Designing and Maintaining Effective Programs

K. PRIORITIES

The establishment of priorities for EPA programs has been heavily influenced by factors beyond the Agency's control. At least until recently the most significant external factor was the detailed legislative direction written into the major environmental statutes. However, within the statutory requirements EPA has a great deal of discretion in establishing its priorities. The Agency is now entering a period in which most of the action-forcing deadlines in the statutes have passed and the laws' mandates are thus no longer as significant in establishing Agency priorities as they were. Continued responsiveness to external forces is appropriate, providing internal safeguards are set up against unproductive uses of Agency resources. Current Agency procedures for setting priorities do not assure that, within the discretion allowed by Congress, EPA resources are routinely assigned where there is greatest need and opportunity for environmental protection.

- *EPA's priorities should be established more explicitly, openly, and systematically to achieve the greatest expected improvement in environmental quality with available pollution control resources; ideally, the estimation of*

expected improvement in environmental quality should be based on quantitative measures of environmental conditions.

Several improvements are required. (1) For each EPA program area, decisions about which pollution problems the program will address, and the long-term control strategy for each, should culminate in a regularly updated strategy document that is analytic in character. This document should lay out the current scientific basis for the chosen strategy and should include attempts to estimate the expected environmental improvement. (2) The Agency should better integrate the various components of its present priority-setting procedures; in particular, short-term priorities and decisions about annual resource allocations within the Agency should be based on a logical relationship to stated longer-term program goals and strategies. (3) Documents supporting the establishment of priorities should make clear what assumptions are used to relate proposed actions to anticipated environmental consequences, and the uncertainties inherent in these assumptions should be used as indicators of the Agency's research needs. (4) Drafts of priority documents should be available for outside review both as a check on EPA's facts and analyses and to facilitate communication of EPA program goals both within and outside the Agency. Suitable modification of current EPA procedures can provide the necessary improvement without burdensome administrative cost.

* * *

THE NATURE OF PRIORITY DECISIONS

Outside influences on EPA priorities are neither avoidable nor regrettable. As with any large and unprecedented new national program, EPA programs must be flexible to accommodate new knowledge and the evolving political articulation of environmental objectives. However, this flexibility has had adverse effects on the Agency that should not be overlooked. The most significant is the preoccupation of EPA leadership with immediate crises at the expense of due attention to ordinary managerial duties and to the longer-term future. Similarly, the Agency's research program has been subjected to the demands of immediate policy questions, detracting from its concerted effort to address underlying regulatory issues. Shifting program priorities have impeded the development of orderly communications and mutual trust along the implementation chain from headquarters through regional office to state and local pollution control authorities, and have weakened the credibility of the enforcement effort with dischargers.

The current need is not to shield EPA from external influences; it is to develop an internal capacity for establishing programs based on the best available empirical data and more clearly tied to specific environmental goals. If the Agency does not have a clear and well based conception of its own priorities it cannot hope to prevent counterproductive or unnecessary disruptions.

Preceding sections of this report have suggested improvements in the formulation of specific EPA regulations, but even highly perfected processes for writing regulations would not, in themselves, guarantee sound environmental programs. Individual regulations are embedded in series of interrelated and, usually, implicit program decisions that are rarely considered at the time that a particular regulation is drafted. Every regulation, for example, is preceded by a determination that there is a problem that warrants action, and by initial decisions about the general size and shape of the appropriate control effort. After the rule is promulgated, EPA continually (if casually) reexamines the rule's priority in relation to other ongoing pollution control efforts, and the Agency may decide to augment or reduce the budget and manpower dedicated to its implementation. Like regulations, decisions about EPA priorities involve the weighing of costs and benefits of alternative actions and rely heavily on the Agency's empirical understanding of relationships between specific actions and their consequences. Unlike regulations, however, priority decisions are not regularly subjected to organized analysis and critical review.

It is useful to distinguish between two types of priority decisions, those that determine the Agency's regulatory *agenda* and those that guide resource *distribution* among established programs.

AGENDA-SETTING PRIORITIES

In some special instances, EPA's agenda-setting decisions amount to the identification of specific pollutants that qualify for predetermined control programs. The selection of substances to be designated as hazardous air pollutants under Section 112 of the Clean Air Amendments (e.g., vinyl chloride and mercury), the listing of toxic effluents under Section 307(a) of the Federal Water Pollution Control Act, and the designation of pesticides products to be curtailed under Section 6 of the Federal Environmental Pesticides Control Act are examples of this simplified type of agenda decision. In many more cases, however, agenda setting requires design of a coordinated strategy to solve an intricate environmental problem that involves several pollutants or complex relationships between a pollutant and environmental conditions. For instance, the control of photochemical oxidants in the air is complicated by the fact that oxidants are formed as a result of incompletely understood interactions between airborne hydrocarbons and nitrogen oxides; further, oxidant concentrations vary with sunlight. Regulatory controls for the oxidant precursors can only be written with reference to the total oxidant problem.

Agenda decisions may also involve establishing relative priorities among the different pollution sources and program elements within a control strategy. Having determined the degree of control necessary for nitrogen oxides, for example, EPA must decide, within the discretion allowed by statute, how much effort will be devoted to stationary and how much to mobile sources, and, further, the degree of control needed for different classes of stationary emitters. In water pollution control, decisions must be made as to the relative effort to be devoted to point and nonpoint sources, and a ranking of the types of point sources is necessary to guide resource allocation to areas where they will have greatest impact on the environment. The design of a control strategy also involves decisions concerning relative levels of effort for different Agency functions. EPA's oxidant control strategy entails allocation of EPA resources to research studies on atmospheric formation and diffusion, the development of emission control technologies for precursors, the inspection and monitoring of sources, and the prosecution of cases against dischargers who violate the rules. The degree of oxidant reduction ultimately depends on the balance of effort among these disparate programs.

EPA has had relative autonomy in setting many important priorities, such as the delineation and phasing of New Source Performance Standards and designation of hazardous air pollutants, and the treatment of nonpoint sources and definition of the class of "major" dischargers requiring early action in water pollution control.

Nevertheless, the agenda for EPA's early years has been influenced by external factors that are impressive both in number and pervasiveness. The chief influence has been the legislation that EPA administers, which is unusually detailed, both in the specification of particular regulatory controls and in setting long-term objectives. The 1970 Clean Air Amendments, for example, sets numerical requirements for five-year reduction of mobile source emission rates and are relatively explicit in prescribing levels of treatment, as in calling for use of best available control technology for new stationary sources. The 1972 water pollution legislation classifies and ranks types of point sources and lays out specific control objectives for 1977, 1983, and 1985. The 1972 pesticide statute calls for fresh reevaluation of the safety of 35,000 pesticide products by 1976, a task that will probably not be completed before 1979.

Another set of external influences on EPA priorities are court decisions that require EPA to address problems the Agency had chosen to defer. Many action-forcing suits were initiated by environmentalists invoking statutory citizen suit provisions and (in the pesticides area) taking advantage of the recently expanded judicial definition of who has standing to sue.

EPA's agenda has also been affected by shifts in the public's environmental preferences that arise as the practical consequences of regulatory programs become clearer and as economic conditions change. For instance, the acceptability of transportation controls for the abatement of air pollution diminished when voters learned of the adjustments that would be required in their driving habits, and the program was curtailed as a result. Rising public apprehension about the nation's dependence on foreign suppliers of petroleum increased the political appeal of using American coal for the generation of electrical power and accounted at least partly for the shift in the sulfur oxides control strategy from the substitution of cleaner fuels to the use of scrubbers.

Finally, the EPA agenda has been affected by a series of unforeseen environmental events. These highly publicized challenges have frequently diverted the attention of top Agency officials and have given currency within EPA to the "pollutant-of-the-month" syndrome. Some of these problems arose from environmental incidents; the Hopewell, Virginia, Kepone contamination episode, for example, has claimed over $2 million in Agency resources (Anonymous 1976b). Other problems followed new research findings. Concern about carcinogens in drinking water grew partly out of environmentalists' studies of cancer incidence in Louisiana (DeRouen and Diem 1975), and the imposition of controls on vinyl chloride emissions followed discovery of a rare form of cancer in workers and new evidence of carcinogenicity in animals (Viola et al. 1971, Maltoni and Lefemine 1974, Popper and Thomas 1975, Thomas and Popper 1975). New or changing measurement technologies have also affected priorities. Nitrosamines are potent carcinogens whose presence in the environment at low levels is detectable by techniques only recently developed. The placement of the nitrogen oxides emission problem on EPA's agenda was significantly changed after it was discovered that the established measurement technique had overestimated ambient concentrations.

A comprehensive evaluation of the adequacy of EPA priority decisions is impossible at present, although there is no shortage of observers ready to assert that EPA is sadly deficient in this area. Environmentalists and their adversaries alike cite apparent anomalies in the Agency's action agenda; in a typical comment, one corporation official (Etcyl Blair of Dow Chemical) stated the recent hope that EPA would at last begin "to harpoon our whales and not waste our energies and resources on the minnows" (Anonymous 1976a). Such observations, however, are based on anecdotal evidence, and they commonly fail to distinguish EPA's own agenda decisions from those imposed on the Agency.

While no comprehensive assessment of EPA's performance in setting its agenda priorities can be supported, it is clear that the Agency's procedures for priority setting can be improved. The formal planning function at EPA is generally regarded as unimpressive.[1] Multiyear program strategy papers have been prepared on occasion in some of the program offices, but they have generally lacked consistency and uniformity and have provided only casual links between stated long-term strategy and short-term program decisions. The underlying technical rationale for the strategies has not been presented in these ad hoc efforts. There has been little attempt to express strategies in terms of measurable environmental goals, and the openness of decision making has varied widely among programs.

In the past year, the Administrator moved to make the writing of program strategy documents more uniform and regular (U.S. EPA 1976a) and draft strategy papers for about one half of EPA's programs have been released for public comment (U.S. EPA 1976b). While useful first steps to strengthening agenda priorities, these measures are still not fully implemented and the available strategy papers are lacking in analytic quality.

The weakness in procedures for setting and implementing priorities in the past is partly a result of pervasive external pressures that would probably have thwarted a stronger planning effort, and partly a result of the common perception in the early 1970s that the country had a backlog of obvious environmental needs that required no sophisticated planning effort.

PRIORITIES IN THE DISTRIBUTION OF EPA RESOURCES

The second type of priority decision includes the regular and, normally, incremental determinations of the relative effort to be expended in ongoing programs. Such decisions are made in establishing annual action commitments for program offices and field units and in determining program budgets.

---

[1] For example, former Deputy Administrator John R. Quarles characterized EPA's past planning efforts in water pollution control as "largely useless, largely a waste of money," that only "gathered dust on shelves," (Quarles 1977).

These distributive priorities have received more consistent treatment at EPA and (with some exceptions) have been less vulnerable to outside perturbations than agenda priorities. EPA budget processes are indistinguishable from current practice in other federal agencies. We make no recommendation about the way these incremental decisions are made, except that the budget process should be more explicitly coordinated with longer-term strategies. EPA's distributive priorities are also established in the annual preparation of program guidance (until this year largely restricted to the activities of the EPA regional offices but now expanding to include headquarters program office operations as well). This process has two interesting features.

First, EPA annually designates a list of "intermedia priorities," which identifies program areas that are to receive special attention during the year. This ranked list of about 15 general program objectives (the FY 77 version is presented in Appendix C) is prepared under the aegis of the Office of Planning and Management and is sent to EPA's regional offices without accompanying analysis. There is no attempt to express the objectives in measurable terms,[2] and the criteria used to generate the list are not circulated. Intermedia priorities are formulated with full and, reportedly, vigorous participation by the regional offices and various headquarters program personnel. The designation and ranking of intermedia priorities appear to be useful for intramural communications, for the list does lay out the Agency's internal consensus as to the year's key programs. Beyond that, it is difficult to gauge its practical utility in coordinating resource allocation. The items on the list are so broad, and the list itself so comprehensive (one source indicated that it covers 80 to 90 percent of EPA's regulatory budget), that their applicability to specific situations is questionable. Most regional officials feel that an item's position on the list is less important than its mere presence; a major practical use of the list, it is generally agreed, is to give regional officials support in discussions with zealous headquarters program offices that want to divert regional resources to an unlisted program category.

The second aspect of annual priority setting in program guidance is the Agency's "management by objectives" system known as the Formal Planning and Reporting System (FPRS). (For a further description, see

---

[2] At the request of the Office of Management and Budget, EPA submitted quantitatively-oriented policy objectives for FY 77 and FY 78. These commitments, part of the President's MBO objectives effort, have not affected the internal priority decisions described in this section.

Section L.) The component of the FPRS that relates to distributive priorities is the annual establishment of quantitative "output" commitments for each regional office for each of 98 specific program categories. All but a handful of these commitments are for management activities, e.g., number of pollution sources identified, permits written, number of inspections made. The commitments are, like program budgets, set incrementally, mainly through discussions between headquarters staff and regional officials.

FPRS commitments may help marginally to establish and coordinate regional priorities, but their ultimate import beyond the simple communication of hopes (a worthy task in itself) is less than obvious. For one thing, the bureaucratic consequences of failing to attain commitments for the largely autonomous regional offices are unclear, and probably subtle. In addition, faced with this large number of program goals that are undifferentiated in relative importance, a regional office is largely left to decide its program priorities for itself.

There is no formal effort to relate intermedia priorities, FPRS commitments, and program budgets in a systematic way. Intermedia priorities are not expressed as quantitative national commitments that can be related to constituent regional commitments, and the many FPRS outputs are not given differential rankings to reflect intermedia priorities. There is, presumably, no lack of informal and implicit trade-off among these activities; budget constraints, no doubt, color any discussion of future output commitments for a regional office, and the consensus represented in the intermedia priorities doubtless manifests itself in subsequent budget changes. The absence of explicit connections, however, makes it difficult to associate specific actions with the logic of the program strategy under which they are performed.

CONCLUSION AND SPECIFIC RECOMMENDATIONS

EPA's agenda will always be influenced by changing political preferences. The Agency's responsibility is to develop improved analytic procedures for its agenda decisions so that EPA programs can accommodate well-founded political interventions while resisting those that are based on popular misconceptions of actual pollution hazards. Without such improvement the Agency may remain more vulnerable to outside influence than is required of a democratic institution. Court review is a proper mechanism for further refining the EPA mission, but judicial actions lack the central coordination that the Agency should help supply. The action-forcing actions of environmentalist and other private groups have improved environmental decision making, but the organizational needs and interests of these groups (including the need to undertake publicly visible actions in order to maintain membership support) can diverge from the public interest. EPA must play an active role to assure that its resources are expended on the most environmentally significant problems.

Procedures for setting distributive priorities also need improvement at this stage in EPA's history. For most of EPA's media programs, the basic control strategy, standards, and regulations are now in place, and future progress will depend heavily on EPA's degree of success in implementing these programs. It is thus becoming increasingly important that annual priorities be guided by analyses of cost–effectiveness and remain open to continuous adjustment as environmental conditions change and scientific advances are reported.

As a general standard, EPA should move to make its procedures for establishing priorities more regular, open, and explicit, and priority choices should be systematically supported by analysis of relative effectiveness, given available program resources. Modification of the current Agency procedures summarized in the preceding pages may suffice to attain the needed improvements.

Specific areas for improvement are:

1. Priority decisions for setting the Agency's agenda and for annual redefinition of program goals should be guided by explicit attempts to calculate anticipated effectiveness. Decision making should include calculation of actual environmental effects when feasible, or of other administrative or pollution control objectives that can be explicitly linked to environmental quality measures (see Section L on the use of environmental indicators). Where quantitative calculations are impractical, specific assertions about known qualitative effects should be made. EPA's long-term program strategies and intermedia priorities should routinely express goals in quantitative terms, possibly using projections for the relevant environmental indicators. When priority decisions (e.g., strategy choices, intermedia priorities) are announced, they should be accompanied by concise supporting documents that are analytic in character.

In some areas, EPA's priorities involve maintaining and using lists of environmental problems. For instance, lists have been maintained for "suspect" pesticides, toxic effluents, hazardous air pollutants, and quality-limited receiving waters. The Agency should screen its own activities and, where areas of list management are identified, assure that classification criteria are explicit and that a systematic attempt is made to first address problems for which greatest environmental impact is expected. A formal hazard evaluation system that applies such criteria as size of population exposed and relative severity of effect may be an important element for some of these areas.

Subjective elements cannot and should not be eliminated in setting EPA priorities: we are not here espousing a deterministic mechnical replacement for human judgment, and we recognize that there is a proper place in priority decisions for both the value judgments of accountable public officials and what the Supreme court has termed "the disciplined feel of the expert" (*FCC* v. *RCA Communications, Inc.* 1953:91). However, there is much to be gained when such judgments are consistently well informed, and this is best encouraged by explicit attempts to gauge the environmental consequences of priority decisions.

2. EPA should introduce more routine to its current procedures for making priority decisions and should establish clearer relationships between its various priority-setting activities.

The Agency should undertake a fresh and comprehensive review of its priority-setting procedures. It is possible that current procedures could serve as the basis for the necessary improvement; longer-term strategy documents, annual establishment of the intermedia priorities, and designation of FPRS commitments may be appropriate building blocks for an improved system if suitably modified. One way of integrating priority decisions would be to make a regularly revised, multiyear program strategy paper the cornerstone of the effort. This document should be oriented toward explicit environmental goals and cross-referenced to annual program objectives so that current year activities can be clearly related to longer-term goals. The strategy document would probably be best organized around environmental problems (rather than by function), and should include discussion of the relative place of each problem in the total program plan. Strategy papers should lay out the factual basis (including both scientific data and legislative direction) for the distribution of control effort among different pollution sources and the allocation of EPA resources to different Agency functions, including enforcement, monitoring, and research. Intermedia priorities should be explicitly related to environmental objectives cited in strategy documents, and should be expressed as targets rather than as general areas of program emphasis. Annual budget changes should systematically reflect intermedia priorities.

3. The need to relate action priorities to measures of ultimate effectiveness will direct the attention of decision makers to areas of empirical uncertainty. Relating specific Agency actions to effluent reduction, effluent reduction to ambient improvement, and ambient improvement to an ultimate impact on man and the environment is never

a simple calculation; yet these are among the necessary steps in making priority decisions. The uncertainty should be clearly identified in priority documents, for it can provide valuable guidance to research and other factfinding efforts inside and outside EPA. Formulation of the OR&D research portfolio would benefit from systematic reference to priority documents, a practice that may enhance the ability of EPA's scientists to coordinate their activities with regulatory needs. In turn, OR&D should participate fully in priority-setting procedures. Explicit treatment of uncertainties may uncover research gaps that are amenable to study by OR&D and that are quite distinct from the short-term research problems highlighted elsewhere in this report (Chapter 3, Sections C, D, and E). Clear delineation in priority documents of the uncertainties associated with local implementation would also help guide the implementation studies effort proposed in Section L.

4. Inasmuch as the establishment of Agency priorities involves choices that are at least as significant as writing individual regulations, similar degrees of open participation should be achieved. The routine intraagency review that now attends rule writing and the formulation of intermedia priorities should extend to all elements of the Agency's priority-setting system. Draft documents should be made available for outside review, and comments should be solicited to assure that assumptions are accessible to critical assessment. The final documents themselves should be released to the public.

L. *ORGANIZATIONAL FEEDBACK*

EPA has not adequately developed or used information on the effectiveness of its past decisions. Agency data management practices make it difficult to identify long-term trends in environmental quality, and monitoring systems provide little information that is useful in the formulation of specific regulations or the evaluation of EPA programs. In addition, there is too little objective information available to headquarters decision makers on incentives and disincentives affecting the actions of local implementing authorities and individual dischargers. The Agency is missing opportunities to learn from its first five years of experience in making major regulatory decisions.

- *The Agency should initiate programs to assure feedback information on the implications of its actions in three areas.*

Environmental indicators: To better assess the ultimate environmental impacts of its actions, EPA should improve its use of monitoring data in decision making and should develop management-oriented environmental indicators that can be used to gauge environmental progress.

The Agency should improve its collection and, more particularly, its analysis of environmental data so that it has a usable, reliable, and timely set of measures of environmental conditions. A set of reliable environmental indicators should be selected and used to enhance EPA's ability to evaluate past program effectiveness on a regular basis, to help set program priorities, and to facilitate analysis of policy alternatives for new regulations. Summary data should be reported to the public on a regular and consistent basis so that long-term environmental trends can be identified and appreciated.

Implementation studies: To improve its understanding of the pragmatic problems of applying regulations to individual dischargers, EPA should initiate a regular program of implementation studies. As part of the program, EPA should reexamine the effectiveness of its formal reporting system and its practices for awarding program grants to state and local governments.

EPA should establish a continuing program of special studies to generate and evaluate information on the outcomes of past regulatory actions. These implementation studies should examine factors that affect the actual application of these regulations to dischargers, and should assess any discrepancies between intended and observed outcomes. The results of these studies will help the Agency to assess the relative merits of the various administrative approaches that have been tried by different regional offices, states, and localities.

Retrospective analysis: To improve analyses supporting regulatory decisions, the Agency should initiate a series of retrospective reviews of the adequacy of past analyses.

A smaller study effort should be devoted to reviews of the quality and adequacy of policy analyses for a sample of past EPA regulations. These reviews would elucidate the relative value of alternative information-handling procedures, provide insights into the accuracy of data sources, and reveal "blind spots" (for instance, faulty assumptions about the ease of implementing a regulation) and their causes.

* * *

THE NEED FOR IMPROVED FEEDBACK

Although somewhat diluted by recent overuse, the concept of "feedback" has important application in the context of environmental decision making. Feedback involves the systematic comparison of actual to desired conditions so that necessary corrective action can be initiated; organizational feedback is the means by which an organization can adapt its programs to changing external conditions and make corrective adjustments when past actions fail to achieve the desired results.[3] Like all organizations, EPA uses several forms of feedback. Some are of its own design, including its Formal Reporting System (FRS)[4] for management information and its environmental monitoring programs. Some are independent, including criticism of the Agency's behavior or ineffectiveness as expressed outside the normal reporting channels, often through traditional political channels.

While maintenance of adequate feedback systems is important to any regulatory agency, it deserves special emphasis at EPA, particularly at this point in its historical development. For one thing, EPA's programs are highly decentralized. This requires uncommon administrative flexibility and keen sensitivity to conditions that are not under the Agency's direct control. A second point is that, in its largest programs, EPA is gradually but perceptibly passing from its formative stage into one of procedural routine and stability. Future progress will come as much from vigilance in seeing that existing regulations are implemented as from writing new rules and designing entire new pollution control strategies. The appropriate emphasis of EPA's first years was on unifying the organization and responding to new legislation. Now, however, the Agency should attend to its management capabilities and assure that the organization learns systematically from past experience. Improved organizational feedback is essential in meeting these needs. Fortunately, EPA's ultimate mission, unlike that of many government programs, is amenable to objective measurement (environmental conditions), a fact that facilitates the use of feedback.

Two general principles guided our evaluation of EPA's internal feedback. First, feedback information should be accurately expressed in terms that are comparable to agency goals, and should be transmitted on a regular and consistent basis. For EPA, this implies need for a steady supply of reliable data on environmental improvement. Among the disadvantages of passive reliance on informal internal systems or on corrections introduced by political intervention are that these mechanisms are irregular and too often are based on subjective impressions rather than on empirical facts about a program's effects.

---

[3] For a concise empirical review of the nature of feedback in federal agencies, see Kaufman and Couzens (1973).

[4] The Formal Reporting System is a component of the Agency's Formal Planning and Reporting System described in the preceding section.

Second, an organization should base its operational decisions on information on administrative inputs as well as ultimate effects. EPA's regulatory decisions are intended to reduce hazard to man and environment, but often the reduction is achieved only through several intermediate steps: a rule is promulgated, then translated into state or local program actions, then applied to particular dischargers, then results in emission or effluent reduction, then improves ambient environmental quality, and then reduces adverse environmental impact. While in the long run EPA programs may be assessed according to pollution reduction and impacts averted, in the short term the organization must also monitor progress at these intermediate stages.

Application of these general principles reveals three areas where internal feedback should be strengthened at EPA. First, the Agency should assure that its regulatory and priority-setting decisions make full use of information on actual environmental conditions, including data for key environmental indicators. Such information is becoming increasingly available but has not been applied systematically to specific decisions. Second, more information is needed on the application of rules (permits, enforcement actions, and so on) to individual dischargers, which may have results quite different from those expected when the rule is written. EPA's reporting system currently transmits tabulations of the numbers of such administrative actions, but these data must be supplemented by information about the content of some of these actions for proper comparison of actual and desired performance. Third, the Agency should routinely review past regulatory decisions in order to identify correctable deficiencies in decision-making procedures and analysis.

ENVIRONMENTAL INDICATORS

Definitions

The Agency must improve its production and use of timely, accurate, and consistent data on environmental conditions. Concern for and use of data on environmental quality should permeate the organization, and should guide those who write regulations, establish long-term strategies and short-term priorities, and evaluate programs.

Environmental measures are conventionally grouped by level. *Impact* measures show the effects of environmental pollution on health and welfare (such as human mortality, morbidity, or bird counts); *ambient* measures describe the concentration of pollutants for a specified area (for example, SO_2 concentration in air, biological oxygen demand (BOD) in water); *emission* measures are rates of pollutant discharge from a source (for instance, NO_x emissions from automobiles expressed in grams per mile, total suspended solids in water effluent in kilograms per ton of production); *activity* measures reflect administrative actions (number of permits issued, number of inspections conducted).

The profusion of data for many pollutants at many locations at many intervals requires that they be summarized to be of practical use to policymakers. Data presented in composite form, here termed environmental indicators, are of more use in evaluating policy alternatives and program activities than are raw data. Indicators may be straightforward aggregations of individual environmental measures (such as the number of monitoring sites that exceed standards during a year, number of fish kills, total BOD removed from effluent by issuance of permits conforming to effluent guidelines, the survival rates for certain test species) or may incorporate other factors (for instance, the number of stream-miles meeting specified water standards, population exposed to substandard conditions for SO_2). One widely known type of indicator is the pollution index, usually a weighted sum of ambient measures for several different contaminants in a particular location. Indices are only one type of indicator that may be useful to decision makers, and are not treated separately here.

EPA and Environmental Indicators

Under EPA guidance, the nation's pollution control program is now producing an impressive volume of monitoring data. By 1974, for example, EPA was receiving at least minimal data on airborne particulates from more than 3600 monitoring stations, and on SO_2 concentration from more than 2100 stations (Council on Environmental Quality [CEQ] 1975:309). Uniform monitoring stations were in operation in all 334 water quality subregions by 1975 (CEQ 1976:261). Investigators who have attempted to analyze available environmental data complain, however, that internal inconsistencies make it almost impossible to piece together data series long enough to discern trends in environmental quality.

EPA has not generally been willing or able to use monitoring data in decision making (NRC 1977). Those developing new regulations have not made systematic attempts to evaluate alternatives in terms of predicted changes in environmental conditions, the Agency's formal intermedia priorities do not express program objectives quantitatively, and the EPA program reporting system (described below) places nearly exclusive emphasis on activity measures.

The Agency is currently engaged in modest efforts to promote further use of environmental measures. The Seattle regional office has initiated work in this area and orients its annual report toward environmental indicators, and the Boston regional office is independently exploring the possibilities of using environmental measures in regional office operations. Headquarters involvement in these initiatives is not large.

In July 1975 the EPA Office of Planning and Evaluation circulated an excellent internal review of the possible utility of environmental indicators. This study reports that:

> At present, there is no comprehensive system of Level I [impact], Level II [ambient] or Level III [emission] environmental indicators in use by either Headquarters or the Regions. Agency environmental measures used are generated on a selective or ad hoc basis, which does not permit them to be fully used in program planning or evaluation (U.S. EPA 1975:9).

The report also notes that efforts to develop new indicators seemed to be largely in the direction of "management activity indicators . . . which were not true measures of environmental quality" (U.S. EPA 1975).

EPA's review recognizes a need for indicators for each measurement level. Management activity indicators clearly have a role in the evaluation of specific subprograms and in determining whether current regulations are being implemented at all. Indicators compiled from emission measures are essential for comparing the performance of different programs dealing with the same pollutants. Ambient indicators are essential to overall evaluation of the air and water quality programs. Ambient and impact indicators have the further advantage of providing the nation with an estimate of what it is buying with the more readily measured costs of environmental programs, thus permitting not only better evaluation by EPA of its own priorities but also better evaluation by the nation as a whole of its environmental priorities.

The EPA study lists specific recommendations for each measurement level. Unfortunately, the study recommendations do not appear to have been followed, and the environmental measures project itself has withered.

Recommendations: Environmental Indicators

The Agency should actively seek to identify or develop environmental indicators that can be accepted as accurate reflections of environmental progress, and should couple decision making to the analysis of real or projected influence on relevant indicators. The best indicators are those that most closely correspond to the Agency's ultimate mission (such as public health and ecological balance). Although theoretically superior, however, these impact indicators rarely provide information of immediate use to decision makers. It is preferable to choose indicators based on ambient measures when feasible, and indicators based on emission measures should generally be chosen only when ambient measures are impractical.

The selection of key indicators is in part political. For example, assessing progress in air pollution control by use of an indicator comprising ambient measures and population at risk resembles a deliberate decision to give smaller population centers less priority in allocating program resources. Such political choices, of course, are inherent in allocation decisions made without reference to indicators; the use of indicators will make such decisions neither more nor less political, but it may make the decisions more visibly political. However, there is no a priori indication that selection of key indicators will defy consensus. Nor is there compelling need for an individual program or subprogram, if its mission is multifaceted, to gauge its performance by reference to a single indicator.

Once accepted, key indicators should serve as yardsticks for Agency decisions affecting the underlying environmental measures. For example, the benefits of various regulatory alternatives should be expressed in terms of effect on appropriate indicators when new regulations are developed. Program strategies, intermedia priorities, and annual program commitments should be predicated on demonstrable improvement in the indicators. Besides assuring an objective basis for EPA policy decisions, adoption of key indicators will facilitate communication of program objectives and accomplishments between EPA headquarters and field officials, and will augment the public's appreciation of environmental progress.

EPA should assure that its own supply of data for environmental measures is intelligible for analytical purposes as well as for public comprehension of the state of the environment. EPA should move to assure comparability of its environmental data, and, when new measurement techniques are introduced, new data should be compatible to old.

The Agency should issue regular and consistent summary reports on the status of environmental measures and indicators.

The Agency should make better use of existing data on environmental measures. There is no need to wait until environmental indicators are adopted or until the last monitoring station is in operation. When new rules are written, discussion of alternatives should review empirical information on present conditions, even if it is flawed, and projected changes in environmental measures should be presented. Routine progress reports from states and regional offices to EPA headquarters should summarize what is known about present environmental conditions in order to inform program evaluators.

The Committee is aware of practical problems that may impede efforts to harness EPA decision making to objective environmental measures.

For example, there are major technical problems. The reliability of monitoring data is not yet to be taken for granted and the siting of monitoring stations is not an exact art. Data inaccuracy can give rise to spurious indications when environmental indicators are compared from year to year and this may require relatively sophisticated methods of data analysis. Impact measures, which are preferable for evaluating Agency actions, are almost impossible to use because environmental influences on the measured events (e.g., cancer incidence) can rarely be distinguished from other influences with any precision; the occurrence of joint causation adds further complexity. The development of ambient indicators faces analogous analytic problems; for both air and water ambient measures, for instance, high levels of pollution discharge are amplified by exogenous meteorological occurrences (such as atmospheric inversions and low precipitation rates), and the technical problems in allocating responsibility between man-made and natural factors are largely unsolved.

Organizational resistance to the introduction of environmental measures may prove a larger hurdle than technical complexity. A major difficulty is that bureaucracies are, reasonably enough, distrustful of evaluation criteria they can control only indirectly. Because of the presence of random influences on environmental measures (like weather), because there is a time lag between implementation of control programs and environmental effect, and because most EPA regulations have force only through implementation by autonomous organizations, evaluations based on proven progress are much less attractive than the activity measures that now dominate the Agency's formal feedback. This bureaucratic tendency, however, is not unalterable; corporation presidents and managers of professional baseball teams work in similar situations, and their positions do not lack for applicants.

IMPLEMENTATION STUDIES

The Importance of Implementation

The scope and diversity of EPA's programs greatly complicate the implementation of its regulations. The effectiveness of administrative rules almost always depends on an understanding of the regulated entity's incentives to comply with governmental objectives. A regulated firm's response is not always predictable. While other agencies can accrue familiarity with the firms in a particular commercial sector, EPA's rules affect the entire range of U.S. industrial firms. For many of them, EPA's regulations are their first exposure to government regulations that directly affects their production technologies. An equally important complication is that those who develop EPA rules are in most cases once or twice removed from direct regular contact with dischargers. In some cases, one of EPA's relatively autonomous regional offices is the primary contact point; more frequently, a discharger's main interaction is with a state or local pollution control authority, which itself communicates primarily with an EPA regional office rather than with EPA headquarters.

The heterogeneity of these implementing organization is yet another challenge for EPA rulemaking. EPA's 10 regional offices play a more significant role in Agency activities than do field offices for the typical federal agency. Forty-one percent of EPA's employees are located in regional offices, nearly matching the 42 percent who are in headquarters (the remaining 17 percent work in research laboratories). In FY 76 the median staff of a regional office was 359 employees and the median budget was over $25 million. Each regional office is led by a Regional Administrator who has a degree of independence consonant with the tenets of "creative federalism" that guided the design of EPA. These senior (generally GS–17) officials report directly to the EPA Administrator. In many decision areas, their authority is extensive; they have broad delegated authority to review state standards and plans, to monitor and enforce discharge standards, and to make substantial operating grants to state agencies. While the regional offices are similar in form and scale, program decisions and styles can and do vary widely.

There is little uniformity in either program *or* structure among state and local environmental programs. The political orientation of these agencies is, of course, as varied as the states themselves, ranging from environmentally progressive to environmentally indifferent. Some programs are embedded in public health departments, some are in separate air and water agencies, some are in multimedia organizations structured like EPA itself, and some are tucked into state-level superagencies with broad missions that include economic development. Some are standard executive departments, some are independent citizen boards, and some possess adjudicatory as well as executive powers.

EPA delegates a great deal of authority to this mixed set of administrative partners. About half of the 56 states and territories, for instance, have accepted delegation of the water pollution permit program. The basic strategy in the air program is federal review of state implementation plans proposed by state authorities, and many states have received full delegation of authority to implement new source reviews and hazardous emissions control. State initiatives in implementation also permeate the 1974 drinking water law and key portions of the 1972 pesticide legislation.

For these programs, the major environmental payoffs for the next phase of the nation's pollution control effort will be in assuring that the basic regulatory mechanisms established in the past five years actually work. This does not imply that the establishment of new programs and policies will cease, as some new legislation is anticipated and a few elements of the air, water, and pesticides programs are still to be introduced. However, among the central issues for decision making will be (a) the extent to which the regulatory system is actually leading to a better environment, and (b) what EPA's early experience reveals about ways to improve the original regulatory mechanism. The shift in emphasis from program design to incremental adjustment brings new imperatives for program evaluation based on accurate information on field accomplishments and studies that elucidate the practical impediments to successful implementation. It does not appear that the evaluation capabilities established in EPA's early years is adequate for the vigorous analysis that is now required.

Recommendation: Implementation Studies

EPA should establish an intramural program to examine the actual results of the application of some past regulations to dischargers.

Decisions to establish conditions for a particular water discharge permit or to enforce a regulation for a specific violation require a great deal of specific information and allow considerable discretion. Too little is known about the way such decisions are made and whether there are factors that consistently prevent these decisions from conforming to original EPA objectives. Such studies are particularly needed to create informed judgments about the effects of variations in regional and state/local approaches to environmental protection. An impressive variety of planning, enforcement, and operational arrangements has been attempted, and the value of this experience must not be lost.

EPA's present mechanisms for assessing program effectiveness appear inadequate in light of the importance of the problem. The Agency's Program Evaluation Division is small and has not been oriented to implementation problems. The headquarters program offices themselves gradually accrue experience with field conditions, but more is required than an informal accumulation of subjective impressions, and there is value in establishing a separate analytic effort that is isolated from the day-to-day perspectives of program office personnel. Regional office staff are generally well informed about specific field conditions, but have little responsibility or opportunity to generalize beyond their immediate experience.

The main program of the implementation studies effort should be a series of empirical investigations of the implementation process, but as expertise grows, other important tasks can be performed. For instance, staff members could help supply pragmatic insights to EPA working groups developing new regulations and to the program offices on translating distributive priorities into guidance for regional offices. The studies program could also help design and evaluate the specific new experiments in implementation strategies (including discharge fees) recommended in Chapter 6.

The typical study project should be a systematic review of the ultimate outcome of EPA regulations. For example, it would be informative to review a sample of final water discharge permits for plants in the same source category that are located in two or three different EPA regions and to compare permit conditions with actual discharges. Such a review would reveal the extent to which the discharge conditions specified in individual permits conform to the effluent guideline under which they were written, and, equally important, would allow systematic investigation of the factors (including availability of technical expertise, time pressures, lack of information on specific conditions at the source, and value differences between EPA and the issuing organization) that are associated with any observed variation. Similarly, it would be instructive to conduct a survey of new source construction permits issued by some representative states' air pollution agencies for a particular new source category. Analysis of the final disposition of a set of cases of discharger noncompliance would illuminate the practical incentives affecting enforcement authorities in their dealings with individual dischargers.

Some portion of the implementation studies effort can profitably investigate the degree to which local conditions affect actual changes in environmental conditions. For example, an attempt could be made to associate air monitoring data for a categorical pollutant with various local regulatory approaches. A larger undertaking would be to assess the observable change in water quality for a watershed that has received extensive federal waste treatement grants.

Smaller analyses of specific implementation barriers affecting a wide range of programs would also be an appropriate element of the implementation studies effort. One obvious need is to assess the effects of inadequate resources in implementing agencies. A study could investigate which tasks are left undone if, as is often the case, resources are not available to do them all and what effect this has on the implementation of national programs. EPA can act as a clearinghouse for useful information on the implementation of environmental regulations. Most states and localities have only limited experience in operating environmental programs and EPA can play a more active role in helping them avoid proven pitfalls in environmental management.

As an adjunct to its series of implementation studies, we recommend early initiation of two specific projects: a comprehensive review of the EPA Formal Reporting System (FRS) and an analysis of the administration of program grants.

The FRS is the Agency's main management tool for systematic assessment of its achievements. It is oriented to quantitative measures and incorporates nearly 200 separate "outputs and activity indicators," each reported for all 10 regional offices. Data are grouped into 38 program elements. (Appendix C presents a full list.) EPA's category 3A, for example, is entitled "NPDES Permit Issuance and Compliance — Nonmunicipal," and includes 17 variables, including these:

- notices of violation issued;
- referrals to Department of Justice;
- major permits issued;
- formal enforcement actions of the states;
- percent of permittees in compliance with schedule;
- reconnaisance inspections by states; and
- sampling inspections by EPA.

FRS reports also supply the primary information base for the Deputy Administrator's semi-annual regional office visit. While those associated with the FRS emphasize that it is merely one of several mechanisms used to monitor the work of regional offices and state/local programs, there is palpable apprehension on the part of field personnel that it amounts to mindless "bean-counting," creates excessive record-keeping burdens, and creates incentives for pursuit of quantity over quality in administrative accomplishment. Some state officials are concerned that because the FRS includes data on the number of enforcement actions, states that succeed in inducing dischargers to comply voluntarily with standards receive less credit than those that treat dischargers as willful adversaries. Further suspicion is aroused by a lack of clarity about the ultimate uses of FRS data at EPA headquarters in the evaluation of regional and state performance.

One unavoidable effect of the long chain from rule formulation to rule application in environmental decision making is a tendency to measure program effectiveness by activities that EPA *can* directly control and to neglect to some extent activities that are closer to actual environmental improvement (e.g., high-quality permits). Part of the perceived problem with FRS is that all but a handful of the variables measure strictly administrative actions. The few exceptions, FRS data entries on percentage of dischargers in compliance, are feared to be either inaccurate or overlooked in an ocean of activity measurements at EPA headquarters.

The FRS has been in operation long enough to permit a comprehensive reassessment of its usefulness. Key review questions should be:

- How are the reported data actually used in EPA headquarters decision making?
- Can ways be found to assure that superfluous data requirements are eliminated?
- Can the FRS be redesigned to accommodate and emphasize data on environmental output indicators?

Distribution of the findings of this assessment to those who must supply FRS data, along with clarification of how the FRS relates to EPA's overall field program evaluation, could go far to ease strains caused by the existence of FRS.

A second special study project should gather basic information on EPA practices in administering program grants. One crucial influence on the effectiveness of EPA decisions is the shortage of resources for implementation. Federal program grants, amounting to well over $150 million per year, supply about 35 percent of the air quality and water quality funds available to the states, and some state programs receive more federal funds than state monies. Thus, EPA appears to have considerable formal leverage over the constraints affecting the implementation of rules, and its regulatory decisions will be improved if resource deployment through grants is integrated as much as possible with regulatory objectives.

At present there is a dearth of information on how grants are awarded. The regional offices have almost full control over grant allocation and funds are distributed without central oversight in Washington. The regional offices negotiate the amount of the grants for state programs and are said to attach various performance conditions, but it is impossible to generalize about the nature and extent (or effectiveness) of these stipulations. It appears that actual revocations are very rare because of the political difficulties associated with withdrawal of federal funding. Many state officals, uncertain as to actual decision rules for allocation, suspect that they are arbitrary at best. Others perceive a perverse effect of the grant system; believing that lagging states continue to enjoy federal grant monies despite a lack of environmental progress, they see no reward to state programs that do comply with EPA grant conditions. EPA has now had several years' experience with a number of grant mechanisms, including conditional grants and the recently discontinued incentive grants. An analytic review of this experience will both promote recipients' understanding of the program's logic and provide a data base for evaluating ways of assuring that EPA regulations benefit from the most effective use of available field resources.

RETROSPECTIVE ANALYSES

Like most government agencies, EPA makes little systematic effort to improve its procedures for making regulatory decisions. The choice of proper procedures is frequently debated and reforms are sometimes introduced, but this is done in the virtual absence of empirical analysis. The Agency should devote resources to a continuing effort to improve its formal procedures through the review of actual past decisions.

A major component of this effort should be devoted to thorough case studies of decisions that have been implemented. These retrospective analyses should focus on such procedural questions as those listed below. It is not necessary to reconsider, on the basis of hindsight, whether the decision was the "correct" policy choice. There should, however, be systematic attempts to compare actual consequences (environmental effects, social costs, and administrative costs) with those that were anticipated when the regulation was written. Retrospective analyses will require detailed familiarity with both formal and informal influences on decision making.

Analytic questions for these studies would include:

1. What specific mistaken assumptions (or facts) led to any major erroneous projections of costs? Of benefits? Were there wholly unanticipated costs or benefits? Were uncertainties overemphasized or underestimated?
2. Were there unanticipated difficulties in implementing the decision? Were barriers to implementation encountered at the local level?
3. Were there significant delays that in retrospect might have been avoided by use of alternative procedures?
4. What were the major sources of reliable empirical information on the crucial factual questions? Was the Agency able to obtain the best available expert opinion?
5. To what extent was the Agency's research capabilities mobilized to answer key questions of fact?
6. To what extent did the policy analysis conform to the tenets of Chapter 2, Section A of this report? What are the reasons for divergence from those guidelines?

In addition to these retrospective case studies, the retrospective studies program should conduct investigations of special topics for larger samples of past decisions. For instance, the utility of advisory committees and problems in the handling of proprietary information could be examined across a representative set of regulations.

An inherent difficulty with the introduction of retrospective studies is that the credibility of a decision may be undermined if it appears to an interested outsider that a fresh policy evaluation is to be conducted. This problem will be mitigated by leaving both case selection and analysis to a staff group that is not in a position to alter the decisions it reviews. Generally, however, the importance of this problem should not be exaggerated. Recent experience does not support the view that retrospective discovery of minor analytic errors will make EPA regulations vulnerable to challenge or reversal. In any event the intelligence gained is worth the risk incurred.

REFERENCES

Anonymous (1976a) EPA official predicts strict rules to enforce new toxic substances law. Environment Reporter—Current Developments 7(28): 1019-1021.

Anonymous (1976b) Paying for Kepone. Chemical Week 119(20): 19.

Council on Environmental Quality (1975) Environmental Quality: The Sixth Annual Report of the Council on Environmental Quality. Washington, D.C.: U.S. Government Printing Office.

Council on Environmental Quality (1976) Environmental Quality: The Seventh Annual Report of the Council on Environmental Quality. Washington, D.C.: U.S. Government Printing Office.

DeRouen, T.A. and J.E. Diem (1975) The New Orleans drinking water controversy: A statistical perspective. American Journal of Public Health 65(10):1060-1062.

FCC v. *RCA Communications, Inc.* (1953) 346 U.S. 86.

Kaufman, H. and M. Couzens (1973) Administrative Feedback; Monitoring Subordinates' Behavior. Washington, D.C.: Brookings Institution.

Maltoni, C. and G. Lefemine (1974) Carcinogenicity bioassays of vinyl chloride. I. Research plan and early results. Environmental Research 7(3):387-405.

National Research Council (1977) Environmental Monitoring. Analytical Studies for the U.S. Environmental Protection Agency, Volume IV. Report of the Study Group on Environmental Monitoring, Committee on National Statistics, Assembly of Mathematical and Physical Sciences. Washington, D.C.: National Academy of Sciences.

Popper, H. and L.B. Thomas (1975) Alterations of liver and spleen among workers exposed to vinyl chloride. Annals of the New York Academy of Sciences. 246:172-194.

Quarles, J.R., Jr. (1977) Shaping the future: an interview with John R. Quarles, Jr., Deputy Administrator, on the planning program authorized by Section 208 of the Federal Water Pollution Control law. EPA Journal 3(1):8-9.

Thomas, L.B. and H. Popper (1975) Pathology of angiosarcoma of the liver among vinyl chloride-polyvinyl chloride workers. Annals of the New York Academy of Sciences. 246:268-277.

U.S. Environmental Protection Agency (1975) First Report of the Environmental Measures Project; Analysis and Applications of Environmental Quality Indicators. Program Evaluation Division, Office of Planning and Management. Washington, D.C.: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency (1976a) Agency Program Strategies. Memorandum from EPA Administrator Russell E. Train to Assistant Administrator, Regional Administrators, and Office Directors. Prepared by Office of Planning and Management. Washington, D.C.: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency (1976b) Draft program strategies: Comment availability. 41 FR 49667.

Viola, P.L., A. Bigotti, and A. Caputo (1971) Oncogenic response of rat skin, lungs, and bones to vinyl chloride. Cancer Research 31:516-522.

6 New Program Strategies

M. MORE EFFECTIVE SANCTIONS

Speed and flexibility of application and credibility are important qualities of the sanctions that can be applied for violations of environmental regulations. Among possible types of sanctions, civil penalties that can be imposed by administrative action are particularly notable for these qualities; however, a number of statutes administered by EPA do not explicitly provide the Agency with civil penalty authority. In addition, existing "all or nothing" financial sanctions against state and local governments not in compliance with EPA grant requirements fail to provide the necessary flexibility and credibility to be effective.

- *EPA should vigorously use its authority to assess civil penalties without going to court. Where such authority has not yet been conferred, statutes should be amended to increase the availability and utility of such sanctions.*

The authority to assess civil penalties by administrative rather than judicial action should include the use of (a) penalties to deter one time or noncontinuous violations (such as the misuse of a pesticide, the failure to report emission data to EPA, or the unlawful spill of a pollutant), and (b) noncompliance fees to encourage the quick adoption of abatement measures by sources emitting pollution in excess of EPA standards.

- *EPA should modify its sanctions under grant requirements to provide for the use of less severe penalties than withdrawal of the grant. The Agency should also develop alternative sanctions that would create incentives for the states to implement environmental regulations effectively.*

* * *

EPA's decision-making process must be sensitive to the Agency's responsibility and ability to implement and enforce regulatory decisions. When sanctions for violation of environmental regulations and incentives for states to implement environmental programs are neither workable nor credible, compliance with regulations is difficult, if not impossible, to enforce. If sanctions are unworkable, regulations and standards must be written to encourage voluntary compliance. Enforcement issues alone, however, should not dictate decisions on regulations and standards; the decisions should be based on many factors, including, public health and environmental considerations.

Environmental legislation has not always provided EPA with flexible and workable sanctions to deter noncompliance with EPA's rules and regulations by industries and state governments. Neither has the Agency consistently taken advantage of the flexibility inherent in the laws. While flexibility and other pragmatic considerations are important, any system of sanctions and incentives must also provide fairness, equity, and full notice to those affected.

SANCTIONS FOR VIOLATIONS BY SOURCES OF POLLUTION

The effectiveness of federal enforcement of environmental standards has increased over the last decade as a result of statutory changes in enforcement authority that have provided increased opportunity for both administrative and judicial action. The legislative history of the 1972 amendments to the Federal Water Pollution Control Act is illustrative (U.S. Congress, Senate 1971:65). Before 1970, enforcement actions at the federal level usually involved a long series of conferences, public hearings, and grace periods prior to the imposition of penalties or court orders (Davies and Davies 1975:198-218, Irwin et al. 1975). The amendments to the environmental laws in the 1970s altered the structure of enforcement activities, but EPA is still not always given the full range of enforcement authority it needs.

EPA's enforcement authority generally provides for three types of actions: criminal penalties, civil penalties, and injunctions or specific requirements to cease or correct a violation. Of these, the civil penalties have certain advantages. Because criminal penalties are considered harsh sanctions to be brought only for flagrant violations, their use is avoided and, as a result, civil penalties provide the economic sanction for most violations. Injunctions only have the effect of stopping a violation that has already occurred rather than deterring it, and they must often be used in conjunction with a threat of monetary punishment for failure to act in accordance with the injunction. The current structure for enforcement does work well for major or gross violations where the threat of large penalties and plant closures can act as a deterrent in spite of the difficulty of imposing the sanctions. More common violations, however, often go without punishment because of the difficulty of imposing sanctions. There is an advantage in having all three types of sanctions available so that appropriate enforcement actions can be taken swiftly and fairly by EPA for any type of violation without resorting to the formal judicial process. However, some statutes fail to provide EPA with any explicit authority for the assessment of civil penalties.

EPA's current use of its civil penalty authority has generally been limited to requests that the maximum allowable penalty be sought, followed by negotiations between the alleged violator and the Justice Department on a settlement of the suit with a less severe penalty. If no settlement agreement is reached and if the Justice Department agrees to pursue litigation, the case is tried in the courts. If a penalty is assessed there, it is assessed by the court. The settlement procedure allows lengthy enforcement proceedings to be avoided but the speed and effectiveness of the process are hindered by the delays of a heavily burdened judicial system, the unwillingness and inability of the Justice Department to pursue some cases, and the resource requirements of litigation. In addition, use of formal judicial procedures and the accompanying adversary positions and publicity discourage less formal actions that could result in voluntary solutions.

To avoid the time and resource requirements and the formality of judicial enforcement, Congress has provided in a few statutes authority for federal agencies to enforce regulations through the use of administrative remedies. The experience of federal and state agencies with assessing civil penalties without bringing court actions suggests that increased use of civil penalties would aid EPA enforcement capabilities. Two systems of civil penalties assessed by administrative agencies have been developed: (1) civil penalties based systematically on such factors as the gravity of the violation and the ability of the violator to pay, like those assessed by EPA for certain violations of the pesticide law; and (2) noncompliance fees based on the financial benefit a polluter enjoys from not complying, like those the State of Connecticut is experimenting with as a means of penalizing sources discharging pollution in excess of standards.

EPA has been given only limited authority to assess civil penalties without going to court; most of the Agency's experience has come from its authority to assess penalties under the Federal Environmental Pesticide Control Act (7 USC 136 1975). FEPCA provides for a product registration process to control the sale, labeling, and shipment of pesticides, and it allows EPA to restrict certain uses of hazardous pesticides. For violations of these provisions, the Administrator may assess civil penalties. The enforcement process requires that the alleged violator be given an opportunity to have a hearing, although, in practice, a conference between the alleged violator and EPA has usually resulted in a settlement. In those cases in which a hearing is requested by the alleged violator, a full adjudicatory process is begun, and the results are ultimately reviewable by federal appellate courts.

FEPCA provides that enforcement of minor violations of the act is discretionary and that any civil assessment should be based upon the size of the business, the gravity of the offense, and the effect of the assessment on the ability of the business to continue operations. EPA has established guidelines for determining the magnitude of the penalty, within the maximum allowable penalty (40 CFR 168 1975). A table of penalties based on size and gravity has been established, and EPA personnel are authorized to negotiate and reduce the set penalty up to 40 percent.

The authority for civil penalties under FEPCA has given EPA a flexible and effective method for handling certain types of noncontinuous violations. Explicit authority similar to that in FEPCA has recently been granted to EPA under the Toxic Substances Control Act (PL 94-469 1976). EPA has also developed a civil assessment system for violation of fuel and fuel additive regulations under the Clean Air Act (U.S. EPA 1975). The Clean Air Act, however, does not explicitly establish the procedures to be followed for civil assessments. As a result, EPA has been hesitant to develop a program similar to that under FEPCA. Under the other environmental laws and under other provisions of the Clean Air Act, the authority to use civil assessment of penalties is even less clear.

A recent General Accounting Office Report to Congress (Comptroller General of the United States 1976) has endorsed the administrative civil penalty and recommended amending the Federal Hazardous Substance Act to give the Consumer Product Safety Commission civil penalty authority. The Administrative Conference of the United States has also recommended the use of civil penalties by regulatory agencies (U.S.

Administrative Conference 1973) and has suggested that a number of EPA statutes provide authority to assess civil penalties administratively (Goldschmid 1973). EPA, however, has not interpreted the laws as giving it the necessary authority.

A new approach to the use of administratively assessed civil penalties has been tried by the State of Connecticut in enforcing air and water pollution control regulations (Connecticut Enforcement Project 1975). The program appears to be more effective than the traditional sanctions of heavy fines enforced through the courts in securing compliance in the case of violations such as continuing discharge of a pollutant or failure to install required emission control devices. The Connecticut approach provides for the assessment of a monthly fee for noncompliance equal to the monthly financial benefit a polluter enjoys from noncompliance. Fees accumulate during the period of noncompliance. This sanction is essentially the imposition of an effluent charge (related to the cost of compliance rather than to the cost of the environmental harm caused by noncompliance) in addition to a standard. The penalty is zero when the standard is met, and the penalty is related to the cost of eliminating the violation when the standard is exceeded. (For a further discussion of effluent charges see Section N on alternative strategies.)

Although noncompliance fees have been used in only a few cases of air pollution in Connecticut, several advantages are already apparent. First, a fee based on factors that relate to the specific violation appears more politically acceptable than an arbitrary penalty. For this reason it may be easier for laws to be changed to provide for the imposition of noncompliance fees. Second, the assessment system provides several opportunities for setting and adjusting the fee. After a firm in violation complies with the regulation or standard in question, the actual cost of compliance can be compared to the fee already assessed, and any excess fee can be returned. Finally, the system provides a flexible approach to encouraging compliance. Connecticut has successfully induced noncomplying firms to meet new compliance dates by promising to return past fees if the dates are met.

EPA has been monitoring the Connecticut experience and could encourage other states to implement similar programs. The major obstacle to the use of this approach appears to be an unwillingness of legislatures to experiment with new alternative systems of enforcement. EPA should, therefore, encourage states to adopt an approach similar to Connecticut's by providing states with technical assistance and earmarking program and planning grants for that purpose.

Both the straight penalty and fee systems for administrative assessment appear to have the advantages of giving EPA the flexibility and speed it needs to enforce the laws effectively. In addition, the credibility of an enforcement threat is increased under such a system. Violators know that under many of the current penalty provisions an agency is unable to bring law suits against all noncomplying sources. Smaller violations are often disregarded, and even major violations are not handled in a timely or effective fashion. Recently courts have upheld laws providing for administrative civil penalties when the laws are framed in terms of a civil rather than a criminal penalty (*Frank Irey, Jr. Inc.* v. *Occupational Safety and Health Review Commission* 1975, *United States* v. *Le Beouf Bros. Towing Co., Inc.* 1976).

EPA should, therefore, reexamine its authority and expand its use of civil penalties, and the laws should be clarified to grant explicit authority to assess both types of civil penalties. The noncompliance fee system would be especially helpful in deterring such actions as the continuous discharge of pollutants into air or water. The straight penalty system should be available for such violations of the law as tampering with noise control devices or automobile pollution control systems; failure to report violations, keep records, or allow inspections; misuse or mislabeling of pesticides; and the unlawful spill of a pollutant.

IMPLEMENTATION AND ENFORCEMENT BY THE STATES

The issue of enforcement authority raises the more general issue of who must implement and enforce environmental laws; when the states fail to enforce the laws, EPA must take enforcement action itself. Most of the statutes administered by EPA reflect a general policy that states and local governments should have primary enforcement responsibility under the laws and that when the states fail to enforce the laws, EPA must take enforcement action itself. EPA is directed to establish national standards under the air and water laws, and states are given the responsibility to implement and enforce federal and supplementary state regulations. Because of the legislative directives and because of limited federal resources, EPA must rely on the states to insure meaningful implementation and enforcement of environmental protection programs. EPA often supplies funds to the states for the operation of pollution control agencies. Existing sanctions for noncompliance with EPA grant conditions by state or local governments typically consist of total withdrawal of blocks of planning or program grants. Such severe sanctions, however, lack credibility because they are politically infeasible and, if applied at all, would only further degrade a state's efforts.

EPA should have a range of incentives and sanctions to apply to state and local implementing agencies. For example, field organizations with a record of weakness should be more closely supervised and instructed. Technical assistance designed to achieve particular administrative goals is a potentially powerful incentive. EPA can provide rewards by reducing paperwork requirements for agencies with a track record of effective use of grant monies. Organizational advice and policy analysis could also be welcome supplements to monetary incentives. However, although it is clear that states with ineffective environmental control programs may require federal aid, EPA, in allocating aid to state and local agencies, should take care not to inadvertently reward those that lag behind in achieving objectives.

N. ALTERNATIVE STRATEGIES

The current regulatory mode used for pollution control does not provide for significant attention to cost–effectiveness nor does it provide for the use of economic incentives, including effluent charges. Operating entirely within the regulatory mode, the Agency has opportunities for improved cost–effectiveness in achieving environmental objectives. The opportunities could be realized, in some cases, without alteration of the current legislative framework; in other cases, statutory constraints would have to be changed. Effluent charges, used either in conjunction with or as a substitute for regulation, have some theoretical advantages and may enable EPA to achieve the goals of environmental protection with greater cost–effectiveness.

- *The current regulatory framework used by EPA should be revised and supplemented to allow the use of management strategies that may be more cost–effective in achieving environmental objectives and that experiment with greater use of economic incentives, including effluent charges.*

The potential costs associated with constraints on cost–effective means of achieving environmental objectives, such as some statutory requirements of uniformity, should be examined. Where such costs are substantial they should be brought to the attention of Congress.

In general, the regulatory mode is preferable when there is an unwillingness to run the risk of not achieving some overriding environmental objective (such as the elimination of a highly toxic substance).

The effluent charge strategy has most promise in those cases where lack of knowledge makes the optimal level of ambient standards uncertain, and where the aim is to achieve significant improvements in the environment with minimal adverse impact on the economy.

* * *

The current regulatory approach, which prescribes ambient environmental quality standards and effluent standards for individual polluters, has been dictated, for the most part, by the legislation under which EPA operates. Ambient and effluent standards to be achieved within fixed deadlines reflect justified impatience and frustration with lack of progress under previous legislation and an expectation that the standards would provide greater certainty and accelerated progress.

Since the early 1970s, some progress in environmental quality has been made. Having made short-term gains, it is now possible to ask whether our strategies are the most efficient in the long run. The more efficiently we can achieve environmental objectives, the greater will be the environmental gains that can be achieved without sacrificing other national objectives.

Despite recent improvements in environmental quality, experience with the current regulatory approach has revealed some weaknesses and shortcomings:

- it has imposed a degree of uniformity on polluters that has been unnecessary and costly, particularly in the case of water;
- it has been cumbersome to administer, requiring the negotiation of compliance schedules, issuance of permits for dischargers, and renegotiation of permits when conditions change;
- it has placed serious burdens on EPA for developing the necessary information to promulgate regulations and for defending such regulations in court, and on both EPA and state authorities for implementing such regulations;
- it has invited foot dragging and delays of all kinds, particularly in the courts: for this reason an alleged advantage of the regulatory approach—the certainty that standards will be achieved by fixed deadlines—has not, in fact, been realized; and
- it has provided no incentives for the polluter to do more than the regulation requires, and, in some cases, little incentive to reduce pollution by an amount that is significant even though it fails to meet the standard.

All these shortcomings may not be inherent in the regulatory approach and, in fact, may exist no matter what approach is chosen, but they do justify experimentation with modifications, supplements, and in some cases, new strategies. It should be recognized, however, that where the achievement of zero or non-zero levels of a highly toxic substance seems imperative, the regulatory approach is clearly appropriate.

COST–EFFECTIVENESS WITHIN THE REGULATORY MODE

Cost–effectiveness is achieved when the incremental costs of reducing pollution are the same for all polluters. The most cost–effective strategy is the one that can achieve a given goal at the least cost.

There exist numerous opportunities within current legislation for equalizing the incremental costs of effluent reduction for different programs. For example, under the Federal Water Pollution Control Act, it would be possible to base some effluent limitations for sources on an interindustry comparison of the incremental costs of control. No such comparison has been undertaken by EPA, despite the fact that there exists evidence of large differences in the incremental costs of control. Although these differences may be due to other considerations, such as the minimization of economic displacement effects, it would be valuable to perform a careful and explicit analysis of alternatives that may be more cost–effective.

More cost–effective strategies might also be applied in the program for publicly owned treatment works. Specifically, EPA could compare the relative cost–effectiveness of such alternative pollution control programs as secondary treatment, combined sewer overflow control, and storm sewer control. Similarly, EPA may be able to apply more cost–effective strategies in the control of stationary and nonstationary sources of air pollution and in the control of point and nonpoint sources of water pollution. For all the possible applications of cost–effectiveness, the information requirements of an ideal analysis are substantial; however, the present situation is one that could be improved upon with currently available information.

Implementing cost–effective means of achieving effluent or emission reductions is more complex in those cases where effluents in different places have different ambient quality effects. It is the effect on ambient environmental quality that is important and not the effluents as such. Geographically uniform emission standards have been justified on the grounds that they are more easily administered and tend to create more equitable conditions for commerce among the states. However, because such standards do not take into account significant local or regional conditions they may, at times, fail to provide a cost–effective method for the control of environmental contaminants. For example, uniform requirements for secondary treatment of municipal discharge of waste water are important for most bodies of water but may be unnecessary for certain ocean discharges.

In some cases, the introduction of geographical nonuniformity in effluent standards may necessitate changes in legislation. For municipal discharges, greater cost–effectiveness might be achieved through the use of two alternative standards: secondary treatment for most municipal discharges and primary treatment with additional control of heavy metals and organic chemicals for certain deep ocean discharges.

Another case in which current policies mandating uniform emission limitations might be modified to allow for two or more classes of limitations is that of automobile emissions. The development of two levels of automobile emission standards depending upon location, with more stringent standards set for areas of the country in which automobile pollution problems are most severe, might provide a more efficient approach to automobile pollution control. (A modified version of such a two-car strategy already exists, in fact, since standards for automobiles sold in California are more stringent than those in the rest of the country.)

Authority to set geographically nonuniform standards currently exists under certain laws. For example, EPA can set different thermal pollution requirements depending upon local ambient conditions and can establish effluent guidelines that vary according to location for discharges from industrial plants, such as sea food processors. Several studies have shown that the use of more cost–effective strategies for ambient environmental quality improvement could result in major savings.[1]

Several additional cost–effective approaches within the regulatory mode should be mentioned. For example, where the precise location of air pollutant emissions is not important but the total amount of emissions must be limited, dischargers could be allowed to sell or otherwise transfer the amounts of pollutants allowed by their current permits. Such an approach might be tried for industrial sources of hydrocarbons in a single air shed. Another approach might be taken toward municipal permits under the Federal Water Pollution Control Act. In several cases, communities have argued that combined sewer overflow control would be far more cost–effective than the secondary treatment they are currently required to undertake. EPA should have the flexibility to allow the use of such control strategies when communities can demonstrate their cost–effectiveness.

---

[1] Kneese, A.V. (1976) Quantitative Comparison of Policy Instruments for Environmental Improvement; prepared for Committee on Environmental Decision Making.

Two major barriers to the implementation of more cost–effective approaches to regulations exist. The first is that current, uniform regulatory schemes are, at times, seen as more fair and equitable than cost–effective policies. The second involves the implementation and burden-of-proof obligations that cost–effective approaches would place upon the regulatory agency. In particular, legislation that required cost–effectiveness would allow regulated parties to raise a set of new issues in the courts. To some extent, this problem could be mitigated by not requiring cost–effectiveness but merely making it possible. The Federal Water Pollution Control Act already provides such a system for thermal dischargers. The dischargers are given a technology-based standard, but they may qualify for a lower standard if they can demonstrate that a less stringent standard would assure the adequate protection of the ecology of the receiving waters.

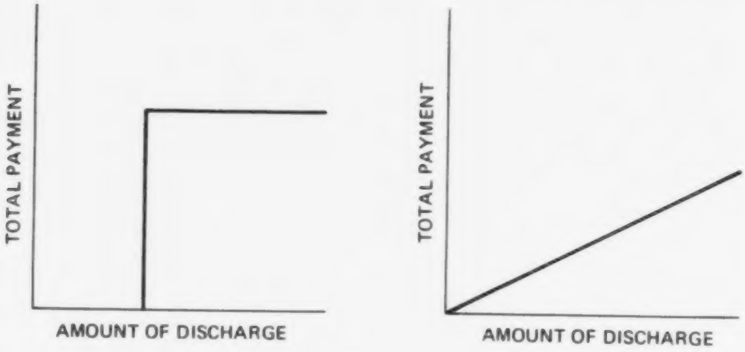
EFFLUENT STANDARDS AND EFFLUENT CHARGES

Two categories of strategies are often discussed as means of implementing pollution control: effluent or emission standards, and effluent or emission charges. Simply stated, effluent standards are maximum levels of discharge that are set to achieve a desired quality of the environment or to meet some other goal. Effluent charges, on the other hand, are fees to be paid by the discharger based on the amount of discharge. The size of the charge will determine the amount of effluent reduction an individual discharger is willing to undertake.

Effluent charges differ from other types of economic incentives in that the total charge is related directly to the total amount of effluent. Economic incentives currently in use, such as grants and accelerated depreciation on pollution control equipment, are designed to reduce the cost of pollution control investments, but bear no direct relation to actual effluent reduction.

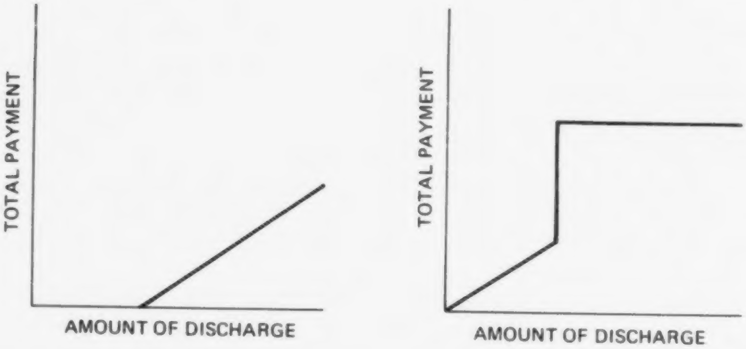
The difference between effluent standards and effluent charges is illustrated in Figure 1. Figure 1a shows how a pure effluent standard works; there is no penalty if the standard is met, and a penalty or fine is imposed for emissions beyond that standard. Figure 1b shows a simple version of a pure effluent charge where a constant charge is imposed per unit of effluent.

A fundamental problem that arises in connection with either effluent standards or charges is that of determining the correct standard or charge to be set. Using effluent standards, it is necessary to determine a set of allowable emissions that will meet ambient quality or other goals. Under



1a. Pure Standard

1b. Pure Charge



1c. Hybrid System: Charge used to reach a standard

1d. Hybrid System: Standard with charge used to further reduce discharge

FIGURE 1 Charges and standards.

an effluent charge approach, it is necessary to determine the level of charge that will result in emissions that meet the goals.

Experience with standards over the last 20 years indicates that setting an emission standard does not necessarily result in the specified degree of emission control (see Section M). Under both standard and charge systems, there are serious questions of how to translate *desired* level of emissions into *actual* emissions control. In many pollution control situations, the problem is simplified by the fact that what is required by law is a substantial reduction in the levels of emissions even if precise ambient quality goals and emissions standards are uncertain. In such cases, effluent charges are advantageous when they can be set high enough to insure significant emissions reductions.

The effectiveness of standards and charges ultimately depends on the discharger's response to them. Adjustments in levels of effluents cannot be made easily or without cost. Clean-up technology is often highly capital intensive and the investment required to respond to one set of standards cannot always be applied to another. Repeated adjustment to new information can be costly, time-consuming, and perhaps infeasible. For this reason, it is often argued that an effluent charge approach, to the extent that it permits fine-tuning, will allow for a degree of flexibility in the response of the discharger.

Effluent charges may differ from effluent standards in the manner in which the burden of clean-up costs is shared. Ultimately, the public will pay the costs of pollution control in the form of higher prices and perhaps more limited availability of certain products. Several studies have shown that while effluent charges can result in significantly lower *total* costs of control than effluent standards, they can result in relatively higher costs to effluent sources since the polluter must pay not only for pollution control equipment, but also for the effluent charges. A charge system could thus raise product prices more than a standards system. However, a system of effluent charges also generates revenues, hence, the distributional impact of the two systems can depend on how these revenues are used. One solution to the problem might be to use the revenues collected from the effluent charges to provide incentives to industry for pollution control. Specifically, an effluent source could be charged for emissions up to a certain point, and beyond that point the discharger could be paid for further effluent reductions. Another solution might be to use the revenues to subsidize expenditures by dischargers for pollution control equipment. Over the long run, such payment schemes could be designed to result in small net payments between the regulatory authority and the effluent sources.

Another important difference between effluent standards and charges is that effluent standards often prescribe or effectively force the use of technologies (e.g., BPT, BAT, secondary treatment, or scrubbers) that may not be optimal in the circumstances of individual polluters. On the other hand, effluent charges may leave the discharger a wider degree of latitude as to the level of control that will be applied and this has advantages. It allows each discharger to seek the best solution to a pollution control problem without having pre-specified solutions or timing imposed. Decisions about control technology become the province of the discharger rather than the regulatory authority.

It is sometimes argued that effluent charges would necessitate more accurate monitoring than would effluent standards, since a charge system would require that the actual level of effluent be known and not simply whether a given threshold has been exceeded. This generalization is not always valid. An evaluation of the different monitoring requirements rests ultimately on the degree of precision needed by the specific regulation strategy. The better the monitoring, the more effectively either system can be enforced.

In any case, complex and detailed monitoring is not a prerequisite for a workable effluent charge system. The European effluent charge systems and the closely related sewer charge systems used by many municipalities in this country usually employ quite simple monitoring systems. Both frequently use standard estimates of discharge levels for different types of effluent sources with the burden of proof resting on the source to show that the discharges are below the estimates. These systems are supplemented with occasional spot checks to insure that pollution control equipment is operating adequately. Although these are clearly not ideal systems of monitoring, they demonstrate the feasibility of effluent charge systems accompanied by only moderate monitoring efforts.

Another approach to the issue of monitoring requirements involves altering related institutional mechanisms. For example, penalties similar to those for inaccurate tax reporting could be used to aid in the monitoring problems associated with effluent charges.

Another problem involves the control of short-term, high discharges. Either by accident (for example, equipment malfunctions) or by deliberate choice, an effluent source may emit high discharges for a short period. Under a system of effluent standards, such discharges would constitute violations and would result in fines or other legal sanctions. In some cases (for example, under the Clean Air Act which provides only criminal sanctions for violations by stationary sources) enforcement of the standards might prove difficult if it could be proven that the discharge was, in fact, accidental. Under a system of effluent charges, short-term, high discharges would be permissible provided that the effluent source was willing to pay the resulting charges, but some degree of control could be exercised by the specific design of the charge structure. For example, the effluent charge (per unit of effluent) could increase as the amount of the effluent increased. This would create an additional incentive for the effluent source to avoid accidental discharges.

HYBRID APPROACHES INVOLVING EFFLUENT CHARGES AND STANDARDS

The representation of an effluent standard in Figure 1a demonstrates a relatively "pure" type that is not commonly encountered. In practice, a combination of selective enforcement and penalties, related in some way to the magnitude of the offense, is used. This system results in higher fines for failing to meet the standard by a large margin than for failing to meet it by a small margin. Similarly, the effluent charge depicted in Figure 1b illustrates a "pure" case, but, as noted above, effluent charge systems can be designed with more complicated fee schedules.[2]

Figure 1 also shows two types of hybrid systems that combine effluent standards and charges. Figure 1c illustrates an effluent charge that seeks to achieve a given standard, with no charge assessed if the standard is met. Such a system would provide incentives similar to those of the pure charge approach as long as discharges were above the standard, but would provide no incentives to reduce pollution to levels below the standard. This approach would have considerable appeal in situations in which the environmental costs of failing to meet a standard precisely were relatively small. In addition, a major advantage of such an approach in the long run is that, unlike a pure effluent-charge system, it would not cost industry any more than would a simple effluent standard; a pure effluent charge would call for continued payment of charges as well as expenditures for treatment. Hybrid systems of this type were considered in Vermont, but they were ultimately rejected because of the political problems involved in assessing charges against municipalities. Similar systems, however, have been used successfully for sewer surcharges in many areas, with a charge assessed per pound of BOD above a given concentration. The approach also bears a close relationship to the Connecticut plan discussed in Section M. The difference is that in the Connecticut plan the fines are related to costs of control rather than to levels of pollution.

Figure 1d shows a second type of hybrid. In this system, there is an effluent standard to be enforced as in Figure 1a, but it is accompanied by an effluent charge. This approach insures a level of pollution control that will meet the standard with a continuing incentive to reduce the level of emissions still further. It thereby provides a dynamic element to regulatory systems without necessitating continual changing of standards and renegotiation as now envisioned in many sections of both the Water Pollution Control Act and Clean Air Act.

---

[2] Bower, B. (1976) Economic Incentives and Disincentives; prepared for Committee on Environmental Decision Making.

One place where this hybrid approach has great appeal is as a substitute for the 1983 best available treatment (BAT) requirements of the Federal Water Pollution Control Act. A pure effluent charge system would not be a complete substitute for the BAT requirement, since a variety of toxic pollutants are currently unregulated and EPA plans to regulate them through the BAT controls. However, a combination of effluent charges and standards might be desirable. Charges could be used for certain pollutants, such as BOD and suspended solids for which desirable levels of control have already been established, and BAT could be retained for the control of toxic substances. The application of such a hybrid system to this case has been carefully studied by EPA.

O. EPA'S ROLE UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT

EPA has a statutory obligation to act as an environmental advocate within the federal government through its review of the environmental impact statements of other federal agencies. EPA review should be superior to private litigation as a prompt and informed means for assessing impact statement adequacy, and for this reason EPA should carry out its review more vigorously.

- *EPA should devote more resources, including sufficient technical staff support, to the discharge of its review function. The Agency should comment at the earliest possible opportunity on expected adverse impacts caused or condoned by the actions of other agencies, emphasizing impacts likely to involve the exercise of EPA regulatory authority at a later date.*

* * *

In the early years of its existence, faced with the problems of transition from a number of small federal units to a single new large regulatory agency and with the problems of rapidly performing its responsibilities under a flood of new regulatory authority, EPA chose to direct its efforts toward its regulatory mission. As a result, the Agency's responsibility to review the environmental impact statements (EIS) of other federal agencies was not always adequately emphasized. Where it was emphasized, decisions affecting the environment were made with a clearer and more explicit understanding of their potential impacts. Now, although EPA has begun to place greater emphasis on its role as environmental advocate for the implementation of the National Environmental Policy Act (NEPA), the major pressures on the Agency remain those of effectively performing its regulatory functions through a balanced evaluation of the impacts of its actions.

Section 102(2)(C) of NEPA requires that all federal agencies prepare detailed statements of the environmental effects of "proposals for legislation and other major federal actions significantly affecting the quality of the human environment" (42 USC 4321 1970). In the preparation of the statements, these agencies must consult with other agencies having jurisdiction by law or special expertise over environmental considerations. In addition, Section 309 of the Clean Air Amendments of 1970 (42 USC 1857h-7 1975) provides that EPA is to review and comment in writing on all environmental impact statements, proposed legislation, and proposed regulations of federal agencies when the likely environmental impact of any such action falls within the authority of EPA under air, water, pesticide, or other environmental statutes (Healy 1973).[3] EPA's comments must be made public at the conclusion of its review. If any federal action is deemed by EPA to be unsatisfactory from the standpoint of public health, public welfare, or environmental quality, Section 309 provides that the determination be published and the matter referred to the Council on Environmental Quality.

Despite the Congressional directive in Section 309 of the Clean Air Act, EPA has not always acted as the major EIS reviewer. In the early 1970s, when the Agency's top priority was given to the development of its own regulatory programs, impact statements of many agencies were so poorly written that EPA found them difficult to review. In addition, EPA quickly learned that a negative review of an impact statement strained the relationships between EPA and the agency responsible for the EIS. EPA's harsh criticism of the Department of Interior's EIS on the trans-Alaska pipeline, for example, outraged officials at the Interior Department. The review of the Atomic Energy Commission's impact statement on the Liquid Metal Fast Breeder Reactor program was also highly critical and led to tensions between EPA and the AEC. Few subsequent reviews have been so openly critical and controversial.

Over time, EPA's performance of its EIS responsibilities under NEPA has improved. The process of review of impact statements within EPA was first governed by EPA Order 1240.1 (April 8, 1971) which established a review procedure that was to be performed in the Washington, D.C., offices. The emphasis on centralized control in the Order was an outgrowth of the timing of EPA's establishment in late 1970. At that time, major decisions were being made on the trans-Alaska pipeline, on the SST, and on pesticide use, and EPA personnel believed that most impact statement reviews would entail passing judgment on important, highly controversial decisions. Centralized review was therefore thought desirable. The procedure, however, quickly broke down under a flood of impact statements (on both controversial and noncontroversial projects) generated by federal agencies. By August 1971, EPA was far behind in its reviews, and procedures were revised to shift some of the burden of the review process to the 10 EPA regional offices.

---

[3] Liroff, R. (1976) EPA Review of Environmental Impact Statements; prepared for the Committee on Environmental Decision Making.

Today, responsibility for reviewing environmental impact statements is divided between EPA's Office of Federal Activities (OFA) in Washington and the regional EPA offices. OFA coordinates all EPA review of EIS at the regional level and develops guidance for EIS review. The Agency has attempted to standardize and upgrade its review procedures by creating a rating system for environmental impact statements. Primary responsibility for initial preparation of reviews resides in the regional offices, with OFA assuming the lead only in unusually controversial projects. In EPA's 1977 regional operating guidelines, OFA urged that the regional offices establish "inter-disciplinary EIS/309 Review staffs capable of handling all but the most technical issues during EIS review" (U.S. EPA 1976:196).

It is difficult to evaluate the impact of EPA's review process on EIS preparation, because EPA's written review comments are only one aspect of a complex political and environmental assessment process, and because direct EIS review and comment is becoming an increasingly smaller part of the review process. Oral communications and other forms of intermittent, undocumented contacts among agencies are assuming greater importance as EPA attempts to increase its impact and to improve interagency coordination. In addition, in its own evaluations of the efficacy of its review process, EPA has to be careful of the sensitivity of other agencies to any EPA claims of credit for enhancing the environmental acceptability of proposed actions of those agencies.

Nevertheless, it is possible to identify some factors that are associated with effectiveness of EPA review activities. First, the quality of EPA's review of EIS prepared by other agencies and the impact of that review upon subsequent decisions depend in part upon the priority that the regional office attaches to the review activity and the importance of the specific proposal under review. There are substantial variations among regions in the investment that is made in the review process.

In addition, the impact of EPA's review comments upon a modification of a federal project are likely to be greatest when the threat exists of eventual violations of EPA standards. The EIS process itself has no built-in sanctions; there is no way for any agency, EPA or CEQ, to disapprove a project on the grounds of adverse impacts documented by the EIS. Even when EPA found the leasing of outer continental shelf lands in the Gulf of Alaska to be environmentally unsatisfactory, a federal court refused to allow Alaska to stop the leasing (*Alaska* v. *Kleppe* 1976). The EIS process may, however, serve as an early warning to sponsoring agencies and their applicants that there are likely to be violations of EPA regulations if the project is completed along the lines of the draft statement.

The performance of EIS reviews by EPA is likely to be less diligent where there is great support for the proposed projects and few potential allies to support EPA in a critical evaluation. When EPA finds itself in opposition to a strong agency that has the support of OMB and the President, it may see little to gain from opposition and may therefore soften its objections. This appears to have been the case with EPA's review of the AEC's EIS for its Liquid Metal Fast Breeder Reactor, although in that case, even the "softened" version of EPA's comments was highly critical. Similarly, EPA is likely to take a stronger stand in the review process when it has allies. In the case of the Kaiparowits Power Project, EPA's objections to the adverse impact upon air quality had a greater effect because the Agency was supported by the National Park Service.[4]

Finally, EPA will be most effective in the EIS review process when the Agency engages in pre-draft liaison with the agency preparing the statement, because sponsoring agencies are most flexible early in the planning process before commitments have been made. The current EPA guidelines for EIS review strongly encourage pre-draft communications.

Since it has special expertise, EPA has been given a special watchdog function by law in reviewing the actions of other federal agencies that may adversely affect the environment. When EPA systematically performs this duty, the principles of NEPA have benefited. At the very least, EPA review serves to deter other federal agencies from making only a token effort toward environmental assessment. At its best, the review process can lead to important changes in project design or operation, as was the case with EPA's review of the EIS for the dredging and filling for a development on Marcos Island, Florida. EPA's recommended changes to reduce environmental hazards were adopted by the sponsoring agency.

---

[4] Ullery, S.J. (1976) The Environmental Protection Agency and the Kaiparowits Power Project: A Case Study of EPA's Performance of its Environmental Review Responsibilities; prepared for the Committee on Environmental Decision Making.

EPA has moved toward a greater expenditure of effort in EIS review, and the benefits of the review process support the desirability of a further strengthening of this role. Effective review can best be accomplished by increasing the resources supplied to OFA and the regional offices and by insuring early input into the decision-making processes of the agency preparing the EIS. EPA's expertise in the areas of its regulatory authority should be made available to other federal agencies through early consultation and through the EIS review process. EPA should insure that its regulations will be fully complied with by proposed federal projects.

REFERENCES

Alaska v. *Kleppe* (1976) 6 ELR [Environmental Law Reporter] 20479.

40 CFR 168 (1975). (Rules of Practice Governing Proceedings Conducted in the Assessment of Civil Penalties under the Federal Insecticide, Fungicide, and Rodenticide Act, As Amended.)

Comptroller General of the United States (1976) Better Enforcement of Safety Requirements Needed by the Consumer Product Safety Commission; Report to the Congress, July 26, 1976. HRD-76-148. Washington, D.C.: U.S. General Accounting Office.

Connecticut Enforcement Project (1975), Economic Law Enforcement. Report to the U.S. Environmental Protection Agency, Region I, Boston, Mass. (6 Volumes.) Boston, Mass.: U.S. Environmental Protection Agency; V.1, PB-258 531 Springfield, Va.: National Technical Information Service.

Davies, J.C., III and B.S. Davies (1975) The Politics of Pollution. 2nd ed. Indianapolis, Ind.: Pegasus.

Environmental Law Institute (1975) Enforcement of Federal and State Water Pollution Controls: Final Draft Report to the National Commission on Water Quality. Contract No. WQ5AC043. Washington, D.C.: Environmental Law Institute.

Frank Irey, Jr. Inc. v. *Occupational Safety and Health Review Commissions* (1975) 519 F 2d 1200 (3rd Cir.), cert. granted, 424 U.S. 964 (1976).

Goldschmid, H.J. (1973) Report in support of Recommendation 72-6: An evaluation of the present and potential use of civil money penalties as a sanction by federal administrative agencies. Pages 896-964, Recommendations and Reports, July 1, 1970–December 31, 1972. Volume II, U.S. Administrative Conference of the United States. Washington, D.C.: U.S. Government Printing Office.

Healy, M. (1973) The Environmental Protection Agency's Duty to Oversee NEPA's Implementation: Section 309 of the Clean Air Act. 3 ELR [Environmental Law Reporter] 50071.

Irwin, W.A., E.I. Selig, K.L. Hall, A.S. Miller, R.A. Liroff, and J.N. Shane (1975) Enforcement of Federal and State Water Pollution Controls. A Report to the National Commission on Water Quality by Environmental Law Institute. (Published by NTIS under title: Water Pollution Control Act of 1972: Institutional Assessment, Enforcement.) 2 Volumes, v.1, PB-246 321; v.2, PB-246 322; v.1 and v.2, PB-246 320, Springfield, Va.: National Technical Information Service.

U.S. Administrative Conference of the United States (1973) Recommendation 72-6: Civil Money Penalties as a Sanction. Pages 70-76, Recommendations and Reports, July 1, 1970–December 31, 1972. Volume II, U.S. Administrative Conference of the United States. Washington, D.C.: U.S. Government Printing Office.

U.S. Congress, Senate (1971) Federal Water Pollution Control Act Amendments of 1971. Senate Report 92-414, Committee on Public Works, 92nd Congress, 1st Session.

U.S. Environmental Protection Agency (1975) Regulation of fuels and fuel additives: Administrative procedures for challenging liability and penalty assessment, and guidelines for assessment of civil penalties. 40 FR 39961; 40 CFR 80.301.

U.S. Environmental Protection Agency (1976) FY 1977 Regional Operating Guidance. Program Evaluation Division, Office of Planning and Management. Washington, D.C.: U.S. Environmental Protection Agency.

United States v. *Le Beouf Bros. Towing Co., Inc.* (1976) 537 F 2d 149 (5th Cir.).

APPENDIXES

APPENDIX A Summary of EPA Decisions Required by the Laws

The charts at the end of this Appendix list the basic decisions EPA is required to make under various environmental protection laws. The charts are meant to provide a general description of types of decisions and of statutory guidance or constraints on EPA's authority. (Provisions of laws dealing with decisions about EPA's research programs and its grant programs were omitted.)

Summaries of the statutory basis for each EPA decision are included. The charts reveal that there is significant variation in the kinds of decisions EPA must make and in the amount of discretion that the Agency is given. For example, under the pesticides law, EPA is required to grant a registration for an establishment that manufactures pesticides if the procedural requirements for supplying production and sales information have been satisfied. The Clean Air Act, however, gives EPA broad discretion in establishing testing regulations for emissions from motor vehicle engines based on "good engineering practices." More typically, EPA is required to base its decisions on factors such as availability of technology and cost of compliance.

The statutes summarized in this appendix are the ones granting EPA most of its authority. They are:

- Clean Air Amendments of 1970,
- Federal Water Pollution Control Act Amendments of 1972,
- Federal Environmental Pesticide Control Act of 1972,
- Noise Control Act of 1972,

- Resource Conservation and Recovery Act of 1976,
- Safe Drinking Water Act of 1974, and
- Toxic Substances Control Act of 1976.

The Clean Air Amendments of 1970 require that EPA establish standards for ambient air quality and for emissions from sources of hazardous pollutants on the basis of protection of public health and welfare, and standards of performance for new sources of air pollution based on the best available systems of pollution control. Each state, or EPA if the state fails, is authorized to administer a program to assure compliance with EPA standards such as the ambient air quality standards for CO, NO_x, HC, Ozone, Particulates, and SO_x. While the compliance date in the Act is set at mid-1977, it is apparent that even the most diligent efforts of EPA and the states will not result in all areas of the country achieving the levels of ambient air quality required by the law.

Control of pollution from motor vehicles and aircraft is an additional responsibility of EPA that requires determination of emission standards and regulations for fuels and fuel additives. Motor vehicle emission standards were originally to be met by 1975; however, the catalytic converter systems used to control vehicle emissions have not yet proven capable of consistently complying with emission standards mandated by Congress.

The Federal Water Pollution Control Act Amendments of 1972 provide that EPA must set limitations on the discharge of pollution to the waters of the United States based on the best available pollution control techniques or, when greater protection from dangerous substances or for water quality is necessary, based on the protection of public health and the environment. Municipal and industrial sources of water pollution must obtain, from EPA or from a state to which EPA has delegated authority, a permit that sets acceptable levels of effluents. In addition, the law establishes an $18 billion grants program for construction of publicly owned waste treatment facilities. (EPA's decision-making process for this, the largest public works program in the nation, was not examined for this study.)

The Federal Environmental Pesticide Control Act of 1972 prohibits the sale or use of a pesticide not registered with EPA. A registration is granted if EPA determines that the pesticide does not create an unreasonable risk to the environment. EPA can impose restrictions on the use of the pesticide and establish requirements for labeling. A registration is not permanent and can be cancelled if examination of the health effects and economic importance of the pesticide shows the risk to be unreasonable. The Act amends and strengthens the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 by providing control over the end use of pesticides as well as the movement of pesticides in interstate commerce.

The Noise Control Act of 1972 authorizes EPA to determine the noise emission standards, such as those that have been set for portable air compressors, large trucks, interstate rail carriers, and interstate motor carriers, based on the best available noise abatement technology. EPA is also authorized to recommend noise emission standards for aircraft.

The Resource Conservation and Recovery Act of 1976 grants EPA regulatory authority to identify hazardous materials and set standards for generation, transportation, and disposal of such materials. The Act also provides for grants to states for solid waste programs if the states satisfy guidelines set by EPA for effective solid waste management.

The Safe Drinking Water Act of 1974 requires that EPA set standards of quality for drinking water based on public health and welfare. EPA is also authorized to regulate injection wells and certain other activities that could contaminate underground water sources. The Act allows the states to maintain primary responsibility for administering the regulations and standards, although EPA will take over if a state fails to perform adequately.

The Toxic Substances Control Act of 1976 regulates the distribution, use, or disposal of chemical substances that EPA has determined will present an unreasonable risk of injury to health or the environment. The Act provides that EPA must be notified of the manufacture or processing of any chemical substance, and EPA can require that the substance be tested to determine if it is a threat to health or the environment before it is distributed or used. Manufacture and distribution of a substance can be denied if its use is deemed a threat to health or the environment.

For purposes of this chart, decisions were categorized as: Promulgation of Standards and Guidelines; Application of Rules to Specific Cases; Delegation of Authority to States; and Enforcement.

Clean Air Amendments of 1970 (Stationary Sources)

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Promulgation of Standards and Guidelines	§107	Promulgate regulation for designation of Air Quality Control Regions (AQCR)	AQCRs are intrastate and interstate areas designated for purposes of attaining and maintaining air quality standards.
	§109	Promulgate and revise National Primary Ambient Air Quality Standards (NPAAQS)	For protection, with adequate margins of safety, of public health [cost is not a factor], and based on EPA established air quality control criteria.
	§109	Promulgate and revise National Secondary Ambient Air Quality Standards (NSAAQS)	For protection of public welfare [cost is not a factor].
	§111	Promulgate and revise New Source Performance Standards (NSPS)	For sources that "may contribute significantly to air pollution which causes or contributes to the endangerment of public health or welfare." Based on best system of emission reduction which (taking into account the cost of achieving such reduction) the Administrator determines has been adequately demonstrated.
	§112	Promulgate National Emission Standards for Hazardous Air Pollutants (NESHAP)	"Hazardous pollutant" if no NAAQS, but it may cause mortality or increase in serious illness. Standard is to provide adequate margin of safety to protect the public health.
Application of Rules to Specific Cases	§110(e)	Grant or deny extensions of 3-year compliance requirement for state's plans to meet NAAQS	For no greater than 2 years; if technology is not available and state has plan for alternative means of reaching NAAQS.
	§110(f)	Grant or deny postponements of application of regulations to a source or class of source	If good faith effort to comply has been made, if technology is unavailable, and if operation of source is essential to national security or public health or welfare.

	§112(c)	Grant or deny NESHAP waivers	No greater than 2 years if time is needed to install necessary controls and interim steps will be taken to protect public health and welfare.
	§119(b)	Grant or deny (subject to interim requirements) temporary suspensions of emission limitation for fuel shortage reasons	If applicant will be unable to comply because of unavailability of types or amount of fuels or if conversion to coal is ordered and source can still comply with a requirement necessary to insure meeting NPAAQS.
	§119(c)	Grant or deny extensions of compliance date for fuel burning sources	If conversion to coal is ordered and will result in violations of NAAQS.
Delegation of Authority to States	§110(a)	Approve or promulgate state implementation plans (SIP)	Plan must provide for attainment and maintenance of NAAQS for each AQCR; approval if SIP provides for attainment of NPAAQS as expeditiously as possible and in less than 3 years, attainment of NSAAQS in a reasonable time, necessary monitoring provision, provisions for new source location review, adequate funding, etc.
	§111(c) and §112(d)	Delegate authority to administer NSPS and NESHAP	If state procedures are adequate to implement and enforce standards.
Enforcement	§113	Notify violator, wait 30 days, if not corrected, issue an order, commence a civil action to stop the violation, or commence a criminal action for penalties (no civil penalties)	Enforcement for any violation of requirement of any implementation plan; criminal action for a knowing violation.
	§115	Call an Abatement Conference	If pollutant is not under a NAAQS or causes an international or interstate pollution problem, and if there is danger to health or welfare.
	§303	Commence a civil action to stop an imminent hazard	If imminent and substantial endangerment to public health and if state or local authorities have not acted to abate the problem.

Clean Air Amendments of 1970 (Mobile Sources)

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Promulgation of Standards and Guidelines	§202	Promulgate motor vehicle emission standards	For a class or classes of vehicles that are likely to cause air pollution that has adverse effect on public health and welfare, considering cost of compliance and technology. Standards shall include a 90% reduction of CO, NO_x, and HC emissions from the base levels.
	§211(b)	Promulgate regulations for fuel registration	Registration if manufacturer supplies necessary information on the composition of a fuel or fuel additive.
	§211(c)	Prohibit sale or use of fuels and fuel additives	If fuel will endanger public health or welfare, or impair the performance of emission control devices. Decisions shall be based on "all relevant medical and scientific evidence" and economic data.
	§231	Promulgate aircraft emission standards	For a class or classes of aircraft that are likely to cause air pollution that has adverse effect on public health or welfare; considering cost and technology, and after consultation with the Secretary of Transportation.

	§ 207(b)	Promulgate methods of testing for vehicle emissions	Test methods must comply with "good engineering practices" and be capable of being correlated with other testing.
Application of Rules to Specific Cases	§ 202(b)	Grant or deny suspensions in motor vehicle emissions standards	For light duty vehicles, a suspension can be granted only if Administrator determines (1) that suspension is essential to public interest, (2) that there has been a good faith effort on part of the manufacturer, (3) technology is unavailable.
	§ 203(b)	Grant or deny exemptions from Act's requirements for Mobile Sources	For purposes of research, training, or national security.
Delegation of Authority to States		None–federal preemption (except for California)	
Enforcement	§ 204 and § 205	Bring suit for injunction or civil penalties (no criminal penalties)	For violation of motor vehicle emission standards, record-keeping requirements, or tampering with emission control devices.
	§ 211	Assess civil penalty	For violation of fuels and fuel additive regulations.
	§ 303	Bring action in court to abate or enjoin an emergency situation	If imminent and substantial endangerment to public health and if state or local authorities have not acted to abate the problem.

Federal Environmental Pesticides Control Act of 1972

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Promulgation of Standards and Guidelines	§ 3(c)	Promulgate registration guidelines	Requirements for application for registration, specifying the kinds of information needed.
(All regulations must be submitted to the USDA, Congressional committees and a scientific advisory panel for comments)	§ 4	Promulgate standards for certification of applicator (one who can use or supervise use of pesticide)	To insure applicators are competent in using and handling pesticides.
	§ 19	Promulgate disposal, storage, and transportation regulations	After consultation with applicable federal agencies, to insure safe handling.
Application of Rules to Specific Cases	§ 3(c)	Classify and register pesticides for general or restricted use	Approval of registration if a pesticide does what it claims, there is satisfactory labeling, and there exists no unreasonable adverse effects on the environment. [General use classification if use of pesticide in compliance with instructions will not cause an unreasonable adverse effect on the environment; restrictive use if further regulatory restrictions are needed.] EPA shall consider the economic, social, and environmental costs and benefits of the use of any pesticide.
	§ 6(b)	Cancel or change classification or registration	Cancellation is required if registrant is not complying with law or if pesticide causes unreasonable adverse effects on the environment, considering the impacts on production and prices of agricultural commodities.

	§6(c)	Suspension of a pesticide registration	If necessary to prevent an imminent hazard during a cancellation proceeding.
	§5	Grant experimental use permits	If a pesticide is not registered, and use is necessary to get information for registration.
	§7	Grant or deny registration of establishments for production.	Registration granted if applicant supplies necessary information on quantity of production, sales, and, when requested, customers.
	§18	Grant exemptions to federal agencies	If emergency conditions exist which require the exemption.
	§25	Grant exemptions from the act	If pesticide is otherwise adequately regulated by another federal agency or if it is of a type not necessary for registration.
Delegation of Authority to States	§4(a) (2) and §5(f)	Delegate authority to states qualified to certify applicators and/or to issue experimental use permits	State plans must contain satisfactory assurances of the agencies authority, funding, and ability to administer programs.
Enforcement	§13(a)	Issue written order to anyone who owns or controls a pesticide to stop the sale or use	If there exists reason to believe there is a violation of the act.
	§13(b)	Bring suit in district court to seize a pesticide	If pesticide is misbranded, adulterated, not registered, not colored as required, makes false claims, or causes unreasonable adverse effects on the environment.
	§14	Commence a suit for civil and criminal penalties	For violation of Act (§12 lists unlawful Acts).

Federal Water Pollution Control Act Amendments of 1972

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Promulgation of Standards and Guidelines	§ 208	Promulgate regulations for setting up programs for areawide planning and waste treatment management	State program must contain a plan for alternatives to waste treatment, establish a regulatory program to control location and construction of facilities and insure proper pretreatment.
	§ 301(b)	Promulgate effluent limitations	Standards include (1) "Best practicable control technology currently available (BPCTCA)," to apply to industrial dischargers by 1977, (2) Secondary treatment, to apply to all publicly owned treatment works by 1977, (3) "Best available technology economically achievable (BATEA)," to apply to industrial sources by 1983, and (4) "Best practicable waste treatment technology over the life of the works," to apply to publicly owned treatment works by 1983. All standards shall be set pursuant to criteria developed under § 304.
	§ 302	Promulgate water quality related effluent limitations	If a point source or group of point sources would interfere with the attainment of water quality in navigable waters, effluent limitations shall be promulgated, considering economic and social costs and benefits.

§304	Promulgate guidelines and criteria	Criteria necessary for evaluating water quality and guidelines for promulgating §301(b) effluent limitation (considering cost of technology). Guidelines for nonpoint source control processes, and guidelines for monitoring and reporting shall also be set.
§306	Set national standards of performance for new sources (for classes of sources listed in law or added by EPA)	Reflecting greatest degree of effluent reduction achievable through best available control technology, considering "the cost of achieving such effluent reduction and any non-water quality environmental impact and energy requirements."
§307(a)	Determine a list of toxic pollutants and set toxic pollutant effluent standards	Toxic pollutants and standards based on toxicity, persistency, effect on marine life . . . . Standards shall provide an "ample margin of safety."
§307(b)	Promulgate pretreatment standards	To treat pollutants that would interfere with, pass through, or that are otherwise incompatible with public treatment works. Pretreatment standards for new sources will be consistent on §306.
§311(b)	Determine list of hazardous substances for which discharge will be prohibited	Substances which present an imminent and substantial danger to the public health and welfare including fish, beaches, etc. shall be listed.
§312	Promulgate marine sanitation devices, standards of performance	Considering costs and available technology, standards are to prevent the discharge of untreated or inadequately treated sewage into navigable waters from vessels.

Federal Water Pollution Control Act Amendments of 1972

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Application of Rules to Specific Cases	§ 301(c)	Grant or deny variances under BPCTCA, BATEA, and Secondary Treatment	Applicant must show that modification will "(1) represent the maximum use of technology within economic capabilities of the science . . . (2) will result in reasonable further progress toward elimination of the discharge of pollutants . . ."
	§ 316	Grant or deny variances in thermal discharge limitation	Applicant must show that EPA's effluent limitation is "more stringent than necessary to assure the protection and propagation of balanced, indigenous population of shellfish, fish. . ." New limitation shall "reflect best technology for minimizing adverse environmental impact."
	§401	Grant certification (necessary to get a NPDES permit)	Certifies that applicant's discharge will comply with § § 301, 302, 306, and 307.
	§402	Grant and condition NPDES permit for discharge	Discharge must meet applicable terms of § § 301, 302, 306, 307, 308, 403 (ocean discharge criteria), and 405 (disposal of sewage sludge). No discharge is allowed without a permit.
Delegation of Authority to States	§ 303	Approve state implementation plans or prepare plan for a state that fails to comply	State must have adopted its own law with standards consistent with Act's policies; state plans must identify waters, water quality criteria, pollutants, planning process, adequate authority, etc.

	§306(c)	Approve state plans for national standards of performance	If plan insures application and enforcement of standards of performance "to at least the same extent as required by [federal standards]."
	§314	Grant funds for Clean Lakes plan to states	Plan must be adequate to restore the quality of lakes.
	§402(b)	Delegate NPDES permit program to states	State agency must have authority and ability to carry out program. EPA approval unless it is determined that state does not have adequate authority to issue permits, to insure compliance with §§301, 302, 306, 307, and 403, to control disposal of pollutants into wells, to enforce permits, and to provide for notice to public and the Administrator.
Enforcement	§309	Notify violator and commence appropriate enforcement action (includes civil or criminal penalties)	For violations, criminal suit if willful or negligent violation.
	§310	Call hearing, make a finding of facts, make recommendations on abatement, and enforce abatement of international pollution problem	If pollution endangers the health or welfare of persons in a foreign country.
	§504	Bring action in court to enjoin an emergency situation	If source is presenting an imminent and substantial endangerment to public health or welfare.

Noise Control Act of 1972

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Promulgation of Standards and Guidelines	§6	Promulgate noise emission standards for products distributed in commerce	For major sources of noise for which standards are feasible. Standards should be based on the protection of public health considering best available technology and cost of compliance.
	§7	Recommend aircraft noise standards to the Federal Aviation Administration	To protect public health and welfare considering technology, safety, economics and after consulting with federal and state agencies.
	§8	Promulgate labeling requirements	To give to users of product information on the levels of noise that will result from use.
	§17	Promulgate railroad noise emission standards	Based on the best available technology considering cost of compliance and after consulting with Secretary of Transportation.

	§18	Promulgate motor carrier noise emission standards	Based on the best available technology considering cost of compliance and after consulting with Secretary of Transportation.
Application of Rules to Specific Cases	§10(b)	Grant or deny exemptions	For purpose of research, investigations, or training, conditioned with necessary restrictions to protect public health and welfare.
Delegation of Authority to States		None–federal preemption in most areas; some state regulation if not inconsistent or not conflicting with federal law	
Enforcement	§11(a)	Commence suit in district court for criminal penalties	For knowing violations of the Act.
	§11(d)	Issue administrative orders	Orders issued to correct violations after notice and opportunity for hearing.

Resource Conservation and Recovery Act of 1976

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Promulgation of Standards and Guidelines	§ 1008	Publish suggested guidelines for solid waste management	Guidelines shall provide technical and economic description of levels of performance that can be attained to protect public health and welfare.
	§ 3001	Designate hazardous wastes	A substance shall be determined hazardous on the basis of toxicity, persistence, and other hazardous characteristics that may cause or contribute to mortality or serious illness.
	§ 3002	Promulgate standards applicable to generators of hazardous wastes	Standards are "to protect human health and the environment" and shall establish record keeping, packaging, and labeling practices.
	§ 3003	Promulgate standards for transportation of hazardous wastes	Standards are "to protect human health and the environment" and shall establish record keeping and labeling practices.
	§ 3004	Promulgate performance standards for the operation of facilities treating, storing, or disposing of hazardous wastes	Standards are "to protect human health and the environment."

	§4002	Publish guidelines to assist states develop solid waste management plans	Plan must identify responsible authority in states and provide for regulation of open dumps. Federal grants to states are available only to states with approved plans.
Application of Rules to Specific Cases	§3005	Issue permits to a facility to treat, store, or dispose of hazardous wastes	Permit issued to facilities in compliance with Act and regulations.
Delegation of Authority to States	§3006	Delegate permit program to states	Delegation unless (1) state program is not equivalent to federal program, (2) state program is not consistent with federal program, or (3) state program does not provide adequate enforcement of compliance.
Enforcement	§3008	Issue and enforcement order, commence a civil suit for an injunction or for a civil penalty, or commence a suit for criminal penalties if the violation is done so knowingly	Enforcement action for violation only after notice is given to violator and violation is not corrected.
	§7003	Commence civil suit to abate an emergency situation	To stop any imminent and substantial endangerment to health or the environment.

Safe Drinking Water Act of 1974

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Promulgation of Standards and Guidelines	§1412(a)	Promulgate Interim Primary Drinking Water Regulations (contaminant levels or performance standards)	To "protect health to the extent feasible, using technology, treatment techniques, and other means which Administrator determines are generally available (taking costs into consideration) ...."
	§1412(b)	Promulgate National Primary Drinking Water Regulations (contaminant levels or performance standards)	After contracting for a study with the National Academy of Sciences; for protection of public health.
	§1412(c)	Promulgate National Secondary Drinking Water Regulations (contaminant levels)	To protect public welfare.
	§1421	Promulgate underground injection control requirements for state programs	After a public hearing and after consulting with the National Drinking Water Advisory Council, EPA shall set "minimum requirements for effective programs to prevent underground injections which endanger drinking water sources."
Application of Rules to Specific Cases	§1415	Grant, deny, revoke, or revise variance (subject to a compliance schedule)	If there exists no techniques available to meet national drinking water regulations and the variance will not create an unreasonable risk to health, or if new system to be used is shown to be as effective as the required technique.

	§1416	Grant, deny, revoke, or revise exemption (subject to a compliance schedule)	If due to compelling factors (including economic factors) the public water system is unable to comply, if the system existed prior to the regulation, and if there will not be an unreasonable risk to health.
	§1424(a)	Designate, upon petition, areas unsuitable for underground injection	If an area has one aquifer which is the sole or principle source of drinking water, and if there exists danger of contamination.
	§1424(b)	Grant or deny interim permit for new underground injection prior to effective date of underground injection control program	Granted only if it is determined that there will be no contamination of an aquifer so as to create a significant hazard to public health. (Permit may be conditioned.)
Delegation of Authority to States	§1413	Delegate authority for regulation of drinking water programs to states	A state qualifies for authority if it has (1) standards no less stringent than national standards, (2) adequate enforcement procedures, (3) reporting programs to EPA, (4) qualified variance and exemption programs, (5) emergency plans and other regulations required by EPA.
	§1421(b)	Delegate authority for regulation of underground injection program to states	A state qualifies if it has adequate permit programs with monitoring and inspection provisions.
Enforcement	§1414(a) and §1423	Give notice to state and enforce with civil action if state fails to abate violation (if program is delegated to state)	For violations of any regulations.
	§1414(b) and §1423	Enforce by civil action (if no state delegation)	For violations of any regulations.

Toxic Substances Control Act of 1976

Type of Decision	Section of Law	Administrator's Authority	Basis for Decision
Promulgation of Standards and Guidelines	§4	Regulations requiring testing of toxic substances	When there is insufficient data with respect to health and environmental effects; considering the costs and availability of various tests.
(Section 2c requires EPA to consider the environmental, economic and social impact of any decision)	§5(b)(4)(A)	Compile list of chemical substances found to present unreasonable risks of injury to health or the environment	EPA shall consider the effects of the substance and the magnitude of exposure.
	§6(a)	Regulate manufacture or use of a substance that presents an unreasonable risk to health or the environment	EPA shall use the least burdensome requirement including prohibition or restrictions on the manufacture, use, or disposal. EPA shall consider the effects, magnitude of exposure, the benefits, and the costs to the national economy, small business, etc.
	§6(e)	Promulgate rules to regulate the manufacture, distribution, and use of polychlorinated biphenyls (PCB)	Rules and regulations for labeling or other requirements to protect against an "unreasonable risk of injury to health or the environment."
	§8	Promulgate rules to require manufacturers to keep records and submit reports	For the purpose of compiling a list of substances and for gathering manufacturing, chemical composition, and health effect data.

Application of Rules to Specific Cases	§4	Grant exemptions from testing requirement	If test data on the equivalent substance has been submitted to EPA, and new tests would be duplicative.
	§5(b)	Require submission of test data	Prior to the manufacture of a chemical substance test data required by EPA must be submitted.
	§5(f)	Take action to protect against unreasonable risks by prohibiting or limiting the manufacture or use	If chemical substance presents an unreasonable risk of injury to health or environment and before a §6 rule is promulgated.
	§5(g)	Grant exemptions to the requirement of submission of test data	Upon a showing that the substance will not present any unreasonable risks.
Delegation of Authority to States		None–federal law is administered by EPA	
Enforcement	§7	Take civil action in a court	To seize or to seek other relief against an imminently hazardous substance.
	§16 and §17	Assess civil penalties and/or commence a suit for an injunction, for civil penalties, or for criminal penalties	For violations of Act or regulations.

APPENDIX

B EPA and Its Programs[1]

EPA'S PLACE IN GOVERNMENT

The Environmental Protection Agency was established in December 1970 as an independent agency in the Executive Branch of government. EPA's Administrator, along with his Deputy and six Assistant Administrators, is appointed by the President with the advice and consent of the Senate. The position of Administrator is a Level II, Executive Schedule appointment, equivalent to that of a Deputy Secretary of a Cabinet department and the directors of large agencies such as the Energy Research and Development Administration and the Central Intelligence Agency, and one level above the Chairmanship of the independent regulatory agencies; incumbents receive a salary of $57,500. In the Ford Administration the EPA Administrator and the Administrator of the Federal Energy Administration were the only two non-Cabinet members who were regularly invited to Cabinet meetings. The Carter White House has also invited the Administrator to its weekly Cabinet meetings. The first Administrator, former state legislator and U.S. Assistant Attorney General William D. Ruckelshaus, served from the establishment of EPA until April 1973, when he was designated FBI Director. His successor, former Council on Environmental Quality (CEQ) Chairman Russell E. Train, served from September 1973 to January 1977. In February 1977 President Carter selected Douglas M. Costle, a former director of Connecticut's Department of Environmental Protection, and, like his EPA predecessors an attorney, as the third EPA Administrator.

---

[1] Effective February 1977.

Five Senate committees and seven House committees have direct Congressional jurisdiction over EPA activities, and the Agency lists more than 20 other committees that have held hearings or briefings on EPA programs. Appropriations in both chambers are determined by the respective Subcommittees on HUD and Independent Agencies. In the Senate, the dominant source of oversight has been the Public Works Committee's[2] Subcommittee on Environmental Pollution, chaired by Edmund S. Muskie (D–Maine). In the House, primary jurisdiction for the air program lies with the Subcommittee on Health and Environment of the Committee on Interstate and Foreign Commerce, chaired by Paul G. Rogers (D–Florida), and primary oversight responsibility for the water program is held by the Subcommittee on Water Resources of the Committee on Public Works and Transportation, chaired by Ray Roberts (D–Texas). The House oversight body for EPA's R&D program is the Committee on Science and Technology's Subcommittee on the Environment and Atmosphere, chaired by George E. Brown, Jr. (D–California). EPA's exposure to legislative review has been extensive as well as intensive; in FY 76 Agency personnel testified at 56 separate Congressional hearings before 43 subcommittees. The Administrator or his Deputy appeared at 26 of these hearings, an average of once every 10 working days. A recent Senate report revealed that from 1973 through 1976 EPA easily led all regulatory agencies with 208 appearances on Capitol Hill; FEA was a distant second with 120 (U.S. Congress, Senate 1977:81).

While small in comparison with Cabinet-level departments, EPA is the largest of the regulatory agencies in terms of appropriations or manpower (Table B.1). Its R&D outlays alone are larger than the total budget of the other regulatory agencies, and EPA's pesticide program, while much smaller than its air and water pollution control efforts, is roughly the same size as the traditional independent regulatory commissions such as the Interstate Commerce Commission, Federal Communications Commission, and Federal Trade Commission.

HEADQUARTERS ORGANIZATION

The Agency's organization chart is shown in Figure B.1. There are six major headquarters offices, each led by an Assistant Administrator. It is a hybrid organization, with three of the offices organized according to policy area (air, water, and toxic substances) and three according to

---

[2] Reformulated as the Environment and Public Works Committee under Senate Resolution 4, passed on February 4, 1977.

TABLE B.1 Comparative Size of Federal Agencies

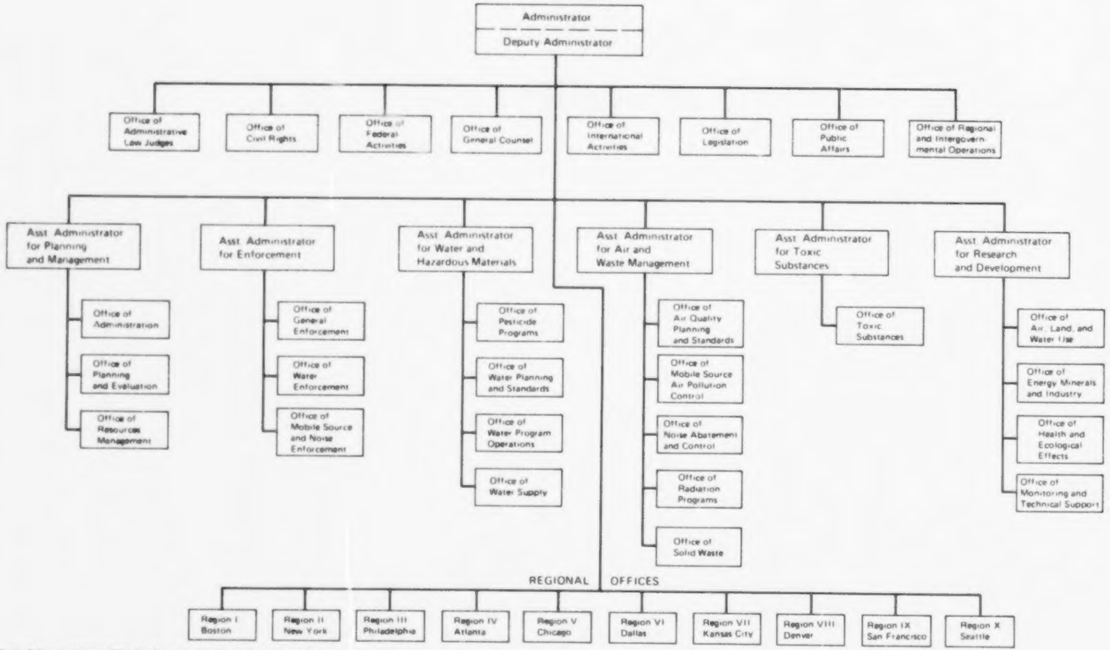
	Budget Authority FY 76 Federal Funds ($ million)	Total Permanent Positions 6/30/76
Department of Defense	97,818.8	951,034[a]
Department of Health, Education and Welfare	44,397.8	136,462
Department of Agriculture	15,002.3	80,413
Department of Transportation	4,866.2	71,593
Energy Research and Development Administration	4,515.1	8,283
National Aeronautics and Space Administration	3,550.3	24,039
Department of Interior	2,535.3	59,130
Department of Commerce	2,252.1	28,823
Environmental Protection Agency	771.5[b]	9,481
Nuclear Regulatory Commission	217.0	2,289
Food and Drug Administration (DHEW)	208.8	6,362
Occupational Safety and Health Administration (DOL)	117.2	2,259
Interstate Commerce Commission	52.5[c]	2,145
Federal Communications Commission	50.9	1,960
Securities and Exchange Commission	49.3	1,904
Federal Trade Commission	47.0	1,637
Consumer Product Safety Commission	39.6	890
National Highway Traffic Safety Administration (DOT)	39.0	846
Federal Power Commission	36.7	1,356
Civil Aeronautics Board	19.9[d]	753

[a] Civilian employment.
[b] Exclusive of construction grant funds.
[c] Exclusive of payments for rail service.
[d] Exclusive of direct payments to air carriers.

SOURCE: Derived from The Budget of the U.S. Government – FY 1978, Appendix.

function (management, enforcement, and research). One consequence of this organizational form is that most EPA policy issues engage the interest of more than one office, necessitating a high degree of intramural coordination.

The largest of these offices, with about 1930 permanent employees, is the Office of Research and Development (OR&D). OR&D operates 15 research laboratories in 9 states (Table B.2). There are also small OR&D facilities at 12 other locations, each facility reporting to 1 of the 15


Administrator
Deputy Administrator
Office of Administrative Law Judges
Office of Civil Rights
Office of Federal Activities
Office of General Counsel
Office of International Activities
Office of Legislation
Office of Public Affairs
Office of Regional and Intergovernmental Operations
Asst. Administrator for Planning and Management
Office of Administration
Office of Planning and Evaluation
Office of Resources Management
Asst. Administrator for Enforcement
Office of General Enforcement
Office of Water Enforcement
Office of Mobile Source and Noise Enforcement
Asst. Administrator for Water and Hazardous Materials
Office of Pesticide Programs
Office of Water Planning and Standards
Office of Water Program Operations
Office of Water Supply
Asst. Administrator for Air and Waste Management
Office of Air Quality Planning and Standards
Office of Mobile Source Air Pollution Control
Office of Noise Abatement and Control
Office of Radiation Programs
Office of Solid Waste
Asst. Administrator for Toxic Substances
Office of Toxic Substances
Asst. Administrator for Research and Development
Office of Air, Land, and Water Use
Office of Energy, Minerals and Industry
Office of Health and Ecological Effects
Office of Monitoring and Technical Support
REGIONAL OFFICES
Region I Boston
Region II New York
Region III Philadelphia
Region IV Atlanta
Region V Chicago
Region VI Dallas
Region VII Kansas City
Region VIII Denver
Region IX San Francisco
Region X Seattle

Note: Effective January 1977. The Toxic Substances Control Act of 1976 authorized the new position of Assistant Administrator for Toxic Substances. It is expected that relevant EPA programs, probably including the pesticide program, will be transferred to this office.

SOURCE: U.S. EPA, Office of Public Affairs.

FIGURE B.1 EPA organization chart.

laboratories. In FY 76 OR&D had new obligational authority of $252.4 million of which $100 million was designated for energy/environment research. The Agency estimates that OR&D accounts for only about 20 percent of the federal committment to environmental R&D, and in fact OR&D nonenergy resources are exceeded by the nearly $200 million that ERDA spends under the heading "environmental research." One hundred thirty three million dollars of the OR&D budget (53 percent) is used for contract research and grants. About $66 million (26 percent) was spent on in-house research, with the remaining 21 percent spent under interagency agreements. Thirty three million (25 percent) was spent for extramural research and development conducted at universities.

Twenty-five EPA facilities that conduct monitoring or other technical activities are administered by other EPA offices (Table B.3). Staffing for these labs amounts to about 65 percent of that of OR&D, and total expenditures are about one-half of these for OR&D's intramural research. Well over 50 percent of the non-OR&D technical resources are located in the EPA Regional Offices' Survey and Analysis Divisions.

OR&D has undergone the most change of EPA's major offices. In response to charges of inadequate management, low staff morale, and low-quality research, a major reorganization of OR&D occurred in 1975 under a new Assistant Administrator. The previous organization had been designed to meet the needs of the Agency to bring together the majority of research activities formerly managed by the various program offices. Many of the changes instituted in 1975 reflected criticisms of the former system. Much of the difficulty experienced by OR&D may be traced to its inheritance of over 40 existing field installations in 1970, and the Agency has had limited flexibility to redeploy these resources. Furthermore, unlike other mission-oriented research programs such as those for space and energy, EPA had to establish an environmental research program with only modest increases in total manpower and budget.

The Assistant Administrator for Research and Development also serves as the Administrator's Principal Science Advisor, a role that is said to occupy about 10 percent of his effort. OR&D conservatively estimates that science advice and technical services to the Agency claim 100 staff-years annually which represents about 5 percent of the Office's work.

The Office of Water and Hazardous Materials (OWHM) and the Office of Air and Waste Management (OAWM), each with about 1000 employees, are the sources of most regulatory initiatives, and serve as lead offices for all but a few of the new regulations developed within EPA. Most of the water office is in Washington, but about 300 OAWM employees work in Durham, North Carolina, on stationary source air

TABLE B.2 Resources of the Office of Research and Development

	Budget FY 76 ($ million)	Positions FY 76
I. Laboratories		
A. *Office of Health and Ecological Effects*		
Research Triangle Park, North Carolina	27.5	254
Cincinnati, Ohio	12.3	113
Corvallis, Oregon	10.0	133
Duluth, Minnesota	7.4	87
Narragansett, Rhode Island	4.7	57
Gulf Breeze, Florida	3.6	50
B. *Office of Energy, Minerals, and Industry*		
Research Triangle Park, North Carolina	39.6	86
Cincinnati, Ohio	17.9	80
C. *Office of Air, Land, and Water Use*		
Research Triangle Park, North Carolina	19.4	98
Cincinnati, Ohio	18.6	160
Athens, Georgia	7.6	73
Ada, Oklahoma	6.5	59
D. *Office of Monitoring and Technical Support*		
Las Vegas, Nevada	12.4	225
Research Triangle Park, North Carolina	6.3	90
Cincinnati, Ohio	4.1	67
TOTAL OR&D LABORATORIES	198.0	1632
II. Other Field Facilities	3.8	32
III. Headquarters Activities	52.2[a]	268
TOTAL OR&D RESOURCES	254.0	1932

[a] Includes $32 million in energy research transferred to other agencies.

SOURCE: U.S. EPA, Office of Research and Development, personal communication, February 1977.

pollution control and some 250 others, located in Ann Arbor, Michigan, work on mobile source air pollution. Although various segments of the scientific and industrial communities have criticized several program offices in EPA for their use of scientific and technical information, the most controversial has been the Office of Pesticide Programs in OWHM, which is currently undergoing an extensive reorganization triggered in part by such criticism but also by the enormous statutory task of reregistering all pesticide formulations.

The Office of Enforcement (OE), with a staff of about 350, is also located in Washington, but represents only about one-fifth of the Agency's total enforcement staffing, as this program is largely decentralized to the EPA regional offices.

TABLE B.3 EPA Monitoring and Other Technical Facilities Outside OR&D

	Budget FY 76 ($ thousand)	Positions FY 76
OFFICE OF AIR AND WASTE MANAGEMENT		
Air Laboratories		
Air Quality Planning and Standards Laboratory, Research Triangle Park, North Carolina	1,550	23
Mobile Source Air Pollution Control Laboratory, Ann Arbor, Michigan	4,600	107
Radiation Facilities		
Eastern Environmental Radiation Facility, Montgomery, Alabama	1,200	48
Las Vegas Radiation Operations Laboratory, Las Vegas, Nevada	853	29
OFFICE OF ENFORCEMENT		
Enforcement Facilities		
National Enforcement Investigation Center, Denver, Colorado	2,700	81
Noise Enforcement Facility,[a] Sandusky, Ohio	364	12
REGIONAL OFFICES		
Annapolis Field Office Laboratory, Annapolis, Maryland	900	34
Pesticide Analysis Laboratories in Regions II, IV, VIII, IX,[b]	651	33
Surveillance and Analysis Divisions[c]		
Region I (Boston)	1,260	52
Region II (New York)	2,200	90
Region III (Philadelphia)	2,170	86
Region IV (Atlanta)	2,493	99
Region V (Chicago)	5,424	139
Region VI (Dallas)	1,795	79
Region VII (Kansas City)	1,150	52
Region VIII (Denver)	1,350	49
Region IX (San Francisco)	1,650	57
Region X (Seattle)	1,258	45
	20,750	748
OFFICE OF WATER AND HAZARDOUS MATERIALS		
Pesticide Laboratories		
Tolerance Chemistry Laboratory,[d] Washington, D.C.	285	11
Plant Biology Laboratory, Corvallis, Oregon	215	11
Technical Services Division Laboratory, Beltsville, Maryland	1,260	56
National Space Technology Laboratory, Bay St. Louis, Mississippi	492	24
COLUMN TOTAL	35,820	1,217

[a] FY 77 Figures—This facility was constructed during FY 76, and FY 77 budget and manpower figures are provided to reflect normal operating levels more accurately.

[b] Budget and manpower resources allocated by the Office of Pesticide Programs, but subject to the discretion of the Regional Administrators.

[c] FY 77 Figures.

[d] This facility has been closed and its function transferred to the laboratory in Beltsville, Maryland.

SOURCE: U.S. EPA, personal communication with each office, February 1977.

The Office of Planning and Management (OPM) has a staff of more than 1000, thus comprising nearly one-fifth of all headquarters personnel. The vast majority of these employees are assigned to the standard administrative, budget, and audit operations inherent in a large organization. About 70 are assigned to OPM's Office of Planning and Evaluation (OPE), whose activities are particularly relevant to the decision-making activities discussed in this report. OPE's FY 77 budget of $5.8 million includes $3.6 for extramural contracts. Fifteen OPE employees are assigned to the Policy Planning Division and are concerned with the near-term and long-term implications of EPA activities. The Agency's Long Range Planning Group is a part of this Division, which in FY 77 has study projects under way totaling over $1.5 million. The Economic Analysis Division, numbering 22 employees, is primarily responsible for analyses of the costs of pollution control and spends about $2.5 million in special studies. The Standards and Regulations Evaluation Division administers EPA's formal system for the development of new regulations (described in Appendix C). Six of its staff of 14 are assigned as special OPE analysts to particular EPA regulations, each analyst following an average of about 15 regulations. The Program Evaluation Division, also with 14 staff members, conducts special study projects and also has continuing responsibility for coordinating the development of program strategies and regional guidance.

The EPA Administrator and his Deputy have an immediate staff of about 50 persons, of which nearly half are assigned to secretarial duties or executive correspondence. The Administrator is also served by 8 staff offices with 300 additional employees. The largest of these, the Office of General Counsel (OGC), is in effect the Agency's "lawyer," and has internal influence greater than its proportion of Agency resources (135 employees and a budget of $2 million). OGC attorneys represent the EPA position in court cases, usually under the direction of Department of Justice attorneys. For those relatively infrequent cases (e.g., pesticide cancellations, some enforcement cases) where, in order to safeguard equity for regulated parties, an environmental statute requires a trial-type internal proceeding for establishing Agency policy, OGC acts as prosecutor. In these cases, the presiding judge is a member of the quasi-independent Office of Administrative Law Judges. The law judges write proposed decisions that are reviewed by the Administrator before becoming Agency policy. Responsibility for review of those environmental impact statements that are not reviewed in the EPA regional offices lies with the Office of Federal Activities (OFA) which has a staff of about 45. OFA also coordinates EPA policies for pollution control at federal government facilities. The Office of Regional and Intergovernment

Operations (ORIO), with a staff of only seven, acts as liaison between the Administrator, the EPA regional offices, and state and local officials, and has primary responsibility for assuring field access to decision makers when regulations are written. The Office of Civil Rights, Office of International Activities, Office of Public Affairs, and Office of Legislation perform duties implied by their names with aggregate staffing of about 150.

The Administrator is served by a Science Advisory Board (SAB) which consists of committees of outside experts who work as volunteers (see Table B.4). The SAB conducts its work through specialized committees, subcommittees, and study groups and an Executive Committee that meets five or six times a year. SAB is supported by a staff of 15, and a budget (in FY 76) of $650,000. Until September 1976, SAB was administratively part of the Office of Research and Development. To some extent the point of liaison to the Agency for SAB has been transferred from the Office of Principal Science Advisor in the Office of Research and Development to the immediate office of the Administrator in that the Deputy Administrator is now the allowance holder for SAB funds, although SAB resources remain part of the Agency's R&D appropriations. In general, the SAB addresses problems referred to it by the Administrator or the Assistant Administrators and has not been engaged in day-to-day decision making at EPA.

EPA also receives advice from 15 other advisory committees (some established by statute), which are either intended to secure technical expertise or to assure review by representatives of outside interests.

FIELD ORGANIZATION

There is a general tendency to underestimate the relative significance and autonomy of the 10 EPA regional offices in the federal environmental program.

Deputy Administrator John Quarles (1976:4) has described the deliberate early decentralization of EPA programs:

> Except in the case of water pollution, none of the programs [inherited by the new EPA] had a strong regional structure. The White House staff had recommended that EPA be made a showcase of decentralization and Ruckelshaus took up the challenge. He decided that each regional organization should mirror the full EPA structure, with staff capabilities in every program area. He also resolved to delegate an extraordinary degree of responsibility to the regional offices, allowing them to run their operations without a constant stream of instructions from headquarters. As a result EPA became one of the most decentralized agencies in the federal government.

TABLE B.4 Committees of the Science Advisory Board of the Environmental Protection Agency[a]

Name	*Number of Members*	*Date Established*
Executive Committee[b]	14	3/6/75
Ecology	15	8/9/74
Environmental Health	18	7/3/75
Environmental Measurements	17	11/3/75
Environmental Pollutant Movement and Transformation	19	11/3/75
Technology Assessment and Pollution Control	16	11/3/75

Subcommittees and Study Groups (active as of February 18, 1977)

Name	*Parent Committee*
Subcommittee on Environmental Lead	Executive Committee
Study Group on Recombinant DNA	Executive Committee
Study Group on Research Relevant to the Effects of Increased Ultraviolet Radiation	Joint-Ecology and Environmental Health
Study Group on Chlorinated Dibenzodioxins and Dibenzofurans in Pesticides	Environmental Health
Study Group on Mutagenicity Testing	Environmental Health
Subcommittee on Epidemiologic Studies	Environmental Health
Subcommittee on Research Relevant to Catalytic Emission Control Devices	Environmental Measurements
Study Group to Review Revised Air and Water Monitoring Strategies	Environmental Measurements

[a] These committees, with the exception of the Executive Committee and the Ecology Committee, replaced earlier advisory committees placed under the aegis of SAB at its inception. The functions of former committees were subsumed under the new committees. The former committees were: Environmental Radiation Exposure, National Air Pollution Control Techniques, National Air Quality Criteria, Air Pollution Chemistry and Physics, Hazardous Materials, and Meteorology. The Committee on Drinking Water Standards was replaced by a statutory committee established under the Safe Drinking Water Act.

[b] The Executive Committee of SAB consists of the Chairmen of each constituent advisory committee and several members-at-large appointed by the Administrator. The Assistant Administrator for Research and Development serves as an *ex officio* member.

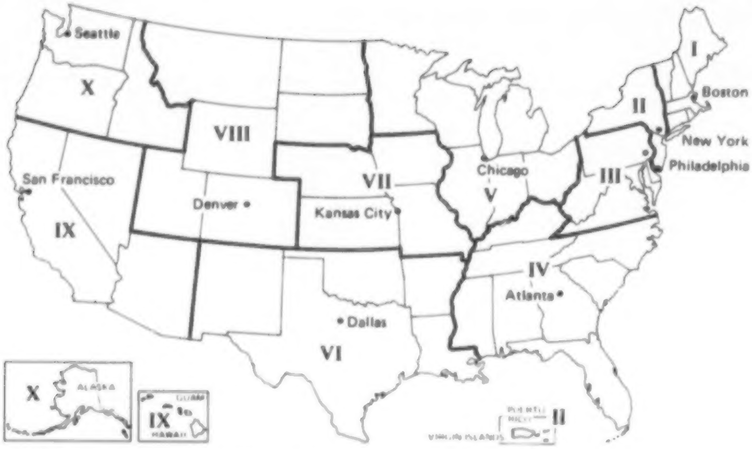
SOURCE: Personal communication with Dr. Thomas Bath, EPA, February 1977.

Figure B.2 shows the geographical areas covered by the EPA regional offices and Figure B.3 displays their organizational structure,[3] which is similar to that of EPA headquarters.

Regional Administrators hold GS–16 to GS–18 ratings, report directly

---

[3] Region II (New York) departs from this form.

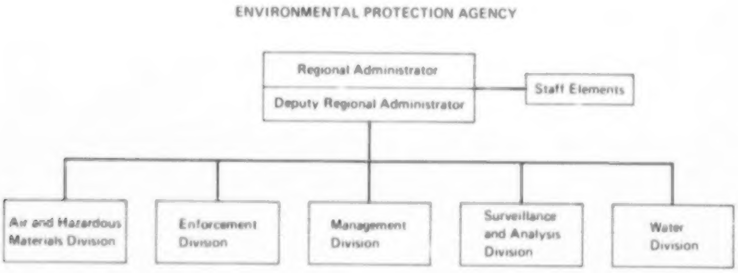

Seattle
X
VIII
San Francisco
IX
Denver
VII
Kansas City
Chicago
V
I
Boston
II
New York
Philadelphia
III
IV
Atlanta
Dallas
VI
X
ALASKA
IX
GUAM
HAWAII
PUERTO RICO
VIRGIN ISLANDS
II

SOURCE: U.S. EPA, Office of Public Affairs.

FIGURE B.2 EPA regions and locations of regional offices.

to the EPA Administrator, and serve at his pleasure. Their independence of headquarters offices extends to such important decisions as whether to approve certain types of delegations of decision-making authority to a state or local program, whether to approve certain changes in state implementation plans for air pollution control, negotiation of the large federal grants to state and local pollution control programs, and regional personnel practices.

Excluding the research and development staff, over half of EPA's


ENVIRONMENTAL PROTECTION AGENCY
Regional Administrator
Deputy Regional Administrator
Staff Elements
Air and Hazardous Materials Division
Enforcement Division
Management Division
Surveillance and Analysis Division
Water Division

SOURCE U.S. EPA Organization and Functions Manual, 9/29/76

FIGURE B.3 Standard organization for EPA regional offices.

TABLE B.5 Total Regional Resources

EPA Region		Budget FY 76	Positions FY 76
I	Boston	$17,062,900	326
II	New York	28,696,700	473
III	Philadelphia	27,600,100	461
IV	Atlanta	38,393,700	523
V	Chicago	45,701,700	633
VI	Dallas	25,604,800	359
VII	Kansas City	16,505,100	278
VIII	Denver	13,314,900	265
IX	San Francisco	25,325,700	342
X	Seattle	16,564,700	261
	Total	$254,770,300	3,921

SOURCE: U.S. EPA, Budget Operations Division, Office of Planning and Management.

personnel are in the regional offices, and the regional budget (including pass-through grant monies) approaches 60 percent of EPA's annual nonresearch expenditures. There is considerable variation in the degree of decentralization of EPA programs; for example, only 47 percent of the staff assigned to air pollution control (again excluding researchers) are in the regions, while over 80 percent of the water quality personnel report to Regional Administrators.

The regional offices vary in size (Table B.5), and the budget of the largest (Chicago) is more than three times as large as that of the smallest (Denver). To give a general indication of the distribution of the regional effort, the median values for subprogram resources are shown in Table B.6.

EPA RESOURCES

EPA was created by consolidation of 15 existing programs in other Executive Branch departments. EPA inherited 5800 employees from these programs, which represents 60 percent of the current staffing levels. Thus, while public appreciation of environmental problems has greatly increased during the 70s, and while major new legislation for air pollution, water quality, pesticides, noise, drinking water, solid wastes and toxic chemicals passed after EPA was established, much of the federal bureaucracy for environmental protection was already in place in 1970. EPA appropriations (excluding construction grants) have grown from an initial base of $300 million at an average of 13 percent per year since the Agency was created (10 percent, if pass-through grants to state

TABLE B.6 Resources Available to the Typical EPA Regional Office (median values for all regional offices)

By Program Area	Budget Authority FY 76	Positions FY 76
Air	$ 6,486,800	59
Water Quality	14,563,300	214
Water Supply	1,077,400	10
Solid Waste	89,300	4
Pesticide	925,900	22
Radiation	45,100	2
Noise	43,100	1
Program Management and Support	243,900	9
Agency and Regional Management	2,009,100	58
Regional Total[a]	$25,325,700	359

By Appropriations Category	Budget Authority FY 76	Positions FY 76
Research and Development	$ 97,400	4
Abatement and Control	21,221,900	189
Enforcement	2,467,800	117
Agency and Regional Management	2,009,100	58
Regional Total[a]	$25,325,700	359

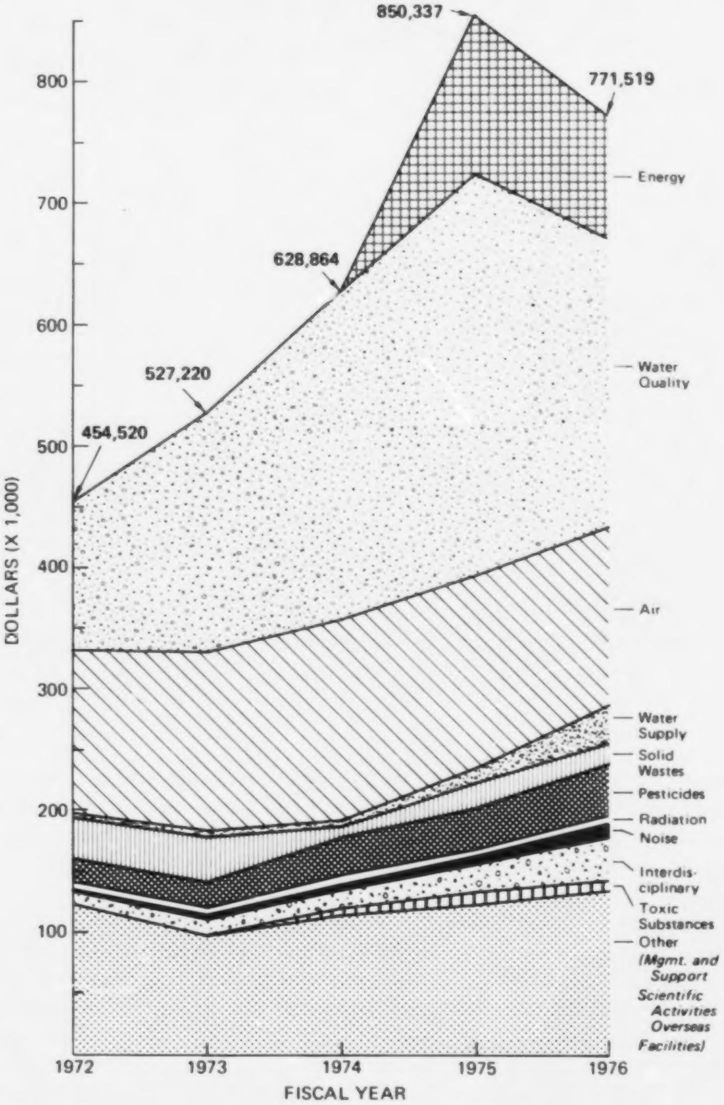
[a] Median values for all regions. Not arithmetic equivalent of the sum of column entries.

SOURCE: U.S. EPA Budget Operations Division, Office of Planning and Management.

and local government programs are excluded); while this growth rate has exceeded inflation, it hardly measures up to dramatic responses that have accompanied other newly-perceived national crises like space and energy. Figure B.4 depicts the evolution of the EPA budget by program area since FY 72.

Table B.7 shows a breakdown of the total FY 77 budget by program area. Of the resources that can be attributed to particular control programs, water pollution (including drinking water) accounts for one half, air pollution one third, and pesticides one tenth. The new toxic chemicals program is slated to grow to about $23 million in FY 78, but will still be only half as large as the pesticides program. New legislation will also allow the solid waste effort to double to $35 million in FY 78.

A significant portion of EPA's appropriations are transferred to state and local government agencies in the form of program or planning grants. In FY 78 program grants will be used in 10 EPA programs.



SOURCE: Personal communication with Elissa Feldman, U.S. EPA Office of Planning and Management, February 1977.

FIGURE B.4 EPA budget authority, FY 72–FY 76, by program area.

TABLE B.7 Budget Authority, FY 76, By Program Area

	$ Million	Percentage of Directly Assignable Budget
Water Quality	238.0	47.7
Air	144.9	29.0
Pesticides	43.7	8.7
Water Supply	32.6	6.5
Solid Wastes	15.7	3.1
Noise	10.2	2.1
Toxic Substances	8.0	1.6
Radiation	6.3	1.3
Interdisciplinary	36.8	
Energy	100.0	100.0
Program Support and Agency Management	128.2	
Other	7.1	
	771.5	

SOURCE: U.S. EPA Justification of Appropriation Estimates for Committee on Appropriations, FY 78.

The largest program grants are for air and water pollution control; at their peak in FY 75, these grant funds reached one-quarter billion dollars. Section 106 of the Water Quality Act specifies state program grants, and Section 208 stipulates grants to local agencies to facilitate the development of areawide waste treatment management plans in designated areas. Section 105 of the Clean Air Act specifies air program grants to state and local governments. Table B.8 shows the magnitude of these grants in recent years. The program grants constitute a significant portion of states resources, accounting for 37 percent and 34 percent of the states' outlays for air and water pollution, respectively, in FY 75. There is considerable variation in the share of federal monies in state programs; for water pollution, for example, 84 percent of North Dakota's program was federally funded in FY 75, but the federal share in California was only 17 percent. The Agency has recently asked that the air and water program grants be newly augmented through 1982.

The preceding overview excludes consideration of the massive water treatment construction grants program administered by EPA. Now the largest single federal public works program, construction grants funds, overshadows EPA's regulatory budget (Table B.9). The grants provide up to 75 percent funding for the construction of municipal waste water treatment facilities; 8800 of these federally funded projects are now active. EPA has recommended to Congress additional funding of $4.5 billion per year for 10 years beginning in FY 77.

TABLE B.8 EPA Program And Planning Grants Awarded To State And Local Agencies ($ million)

Grant Type[a]	FY 74	FY 75	FY 76[b]	FY 77[c]
Air Program Grants	39.4	49.2	60.3	52.5
Water Program Grants	35.7	48.6	62.3	50.0
Areawide Waste Treatment Planning Grants (§ 208 Grants)	13.2	149.9	53.1	15.0[d]
Safe Drinking Water Grants	–	–	8.0	20.0
Clean Lakes Demonstration Grants	–	–	6.3	15.0
Great Lakes Pollution Control Grants	4.7	1.6	2.0	1.6
Pesticides Program Grants	0.4	1.4	4.6	10.3
Solid Waste Demonstration and Planning Grants[e]	0.5	2.6	2.8	2.9
Total	93.9	253.3	199.4	167.3

[a] New legislation authorizes grant programs for FY 78 in the toxic substance control program (estimated at $1.5 million) and resource conservation program (estimated at $12 million)

[b] Includes transition quarter

[c] Authorization

[d] The Administration has requested supplemental appropriation of $69 million for this grant program in FY 77

[e] Includes some awards to nongovernmental entities

SOURCE: U.S. EPA, Grants Information Division and Program Analysis Division.

TABLE B.9 Construction Grants in Relation to EPA Regulatory Budget

	Regulatory Budget Authority	Construction Grants (Obligations)
FY 73	517 million	1,591 million
FY 74	642 million	1,384 million
FY 75	849 million	3,616 million
FY 76	772 million	5,400 million
FY 77 (est.)	780 million	6,000 million

SOURCE: U.S. EPA (1977) *Clean Water: Report to Congress 1975–1976* (Washington, D.C., Government Printing Office) p. 27.

REFERENCES

Quarles, J.R. (1976) Cleaning Up America: An Insider's View of the Environmental Protection Agency. Boston, Mass.: Houghton Mifflin.

U.S. Congress, Senate (1977) Study on Federal Regulations. Volume II: Congressional Oversight of Regulatory Agencies. Committee Print, Committee on Government Operations, 95th Congress, 1st Session.

APPENDIX C

EPA Procedures for Decision Making

STANDARDS AND REGULATIONS

EPA procedures for writing standards and regulations are elaborate in comparison with practices in other federal agencies. The procedures, designed primarily to assure that new rules systematically benefit from careful review and participation by various EPA components, call for clearance by a standing Steering Committee of major EPA officials before a proposed or final regulation formally passes to the Administrator for his consideration. The following description of these procedures (effective February 1977) is based on Agency memoranda, informal tabulations compiled by EPA, interviews with EPA officials, and our review of the key decision documents (the "Paper Trails") for a sample of 20 past EPA decisions.

Perhaps the most conspicious feature of the Agency's early regulation writing was its volume; demanding new environmental statutes required the Agency to produce large numbers of standards and regulations in short order. In FY 74, for instance, the environmental volume (title 40) of the *Code of Federal Regulations* doubled in length to 2000 pages (and in weight to five pounds) and two years later expanded further to 3280 pages. The profusion of early EPA rules contributed to the Agency's interest in introducing careful decision-making procedures, since both OMB and reviewing courts openly criticized the quality of the analysis accompanying rapidly forged EPA regulations. In addition, the functional basis of EPA's structure, with separate offices for research, media programs, enforcement, and Agency management, created a special need for intramural coordination.

Not all published EPA decisions are products of the Steering Committee system; in fact, in a recent sample, only about one-sixth of the items published in the *Federal Register* had been subjected to formal Steering Committee review. The majority of the printed regulations are minor modifications of earlier regulations or are routine decisions (e.g., registration of a specific pesticide product) typically delegated to lower level EPA officials. These lesser decisions are excluded from the Steering Committee procedures, as are purely administrative matters and delegations of decision-making authority.

Three types of major decisions have also been excluded from Steering Committee review for various reasons. First, the pesticide statute (FEPCA Section 6) mandates special trial-type proceedings when EPA cancels or suspends the federal registration of a pesticide. These lengthy formal proceedings, which have been used for the five major actions (DDT, Aldrin/Dieldrin, Heptachlor/Chlordane, Mirex, and Mercurials), culminate in an Administrative Law Judge's proposed decision, which is reviewed and possibly reversed by the Administrator. The newly instituted procedures for assessing the 130 "suspect" pesticides that may later be subjected to Section 6 hearings are also separated from the Steering Committee, but were modeled on the Steering Committee system and share many of its features. Second, the issuance of effluent guidelines for water discharge permits has taken place outside the Steering Committee because separate handling of this large number of similar regulations was thought more efficient. These separate procedures were also modeled on the Steering Committee system, although in practice some shortcuts were used in recent years. The Agency now plans to reintegrate the writing of effluent guidelines into the Steering Committee system. Third, revisions of the state implementation plans under the Clean Air Act are outside the Steering Committee's purview, ostensibly because they are numerous, repetitive, and the basic decision-making authority usually lies with Regional Administrators rather than with EPA headquarters.

Despite these exceptions, the Steering Committee procedures are at the heart of EPA regulatory decision making for they govern the development of most of the salient and precedential regulatory policies. EPA's Steering Committee is currently presiding over the writing of about 125 items, and releases about 60 proposed and final rules annually. The Agency calculates that, on the average, a regulation takes about 25 months from litigation to promulgation. Responsibility for coordinating the Steering Committee's program is held by the Standards and

Regulations Evaluation Division of the Office of Planning and Management, which normally assigns an analyst to each regulation and provides all administrative support. Procedures are specified in a 49-page revised draft "Development of Regulations" Manual.

A typical regulation is developed in the seven following discrete steps.

ADMINISTRATOR'S INITIAL APPROVAL

An EPA office wishing to write a new regulation (the "lead office") cannot officially begin drafting a new rule until formal clearance is given by the Administrator, which generally requires one or two months. The lead office request for clearance must include a development plan, which is to feature:

- an indication of the available regulatory alternatives to be evaluated;
- an explicit plan for internal EPA coordination during development;
- a plan for external consultation by interested parties; and
- a publication schedule.

Our Paper Trails study (cited in Appendix F) found that this development plan had been prepared in fewer than half the relevant cases, but the Agency reports that the plan is now in fact a regular feature. The requirement of initial clearance is intended both to prevent unnecessary federal regulation and to guard against deficient plans to involve interested inside and outside groups in decision making.

Review of the origins of new EPA regulations shows the degree to which external factors have influenced the formulation of EPA rules that usually had no precedent. Although the situation has gradually changed in recent years, tabulations from our Paper Trails analysis indicate that new regulations have only rarely been generated autonomously by EPA. Sixteen of the 20 sample decisions were either explicitly required by the new environmental laws or were authorized by statute and instigated by suits brought by environmental groups, and three others were triggered by new scientific or technical findings. Only one resulted from EPA initiative in the absence of external events. Only 2 decisions among the 20 had clear precedents in earlier Agency actions.

WORKING GROUPS

Once authorization is received from the Administrator, the lead office can request that an ad hoc "working group" be formed to draft the new rule. Working groups are chaired by lead office representatives. Invitations for nominations for working group representatives are sent to 13 different EPA offices, including the six Assistant Administrators, Office of General Counsel (OGC), Office of Regional and Intergovernmental Operations (ORIO), Office of Public Affairs (OPA), and the Program Analysis Division (PAD) of the Office of Planning and Management. Each office has particular responsibilities in rule development. ORIO is to arrange for (and monitor) regular participation by regional office representatives and, if possible, by state and local officials, in order to enhance contributions by those who will ultimately implement the EPA rule. OPA is to consult on the working group's arrangements for consumer and public participation in rule writing. PAD is to analyze EPA workload implications and resource requirements.

The operating styles of working groups vary widely. The roles played by working group members are subject to considerable variation, and appear to depend to some degree on the level of personal interest of the representative selected. Generally it appears that (among others) OR&D, PAD, OPA, and designated regional office officials make only sporadic contributions to the working group. One significant impediment to involvement by OR&D and regional office representatives is said to be the difficulty of arranging the necessary trips to Washington (or, for air pollution control regulations, to Durham or Ann Arbor) especially when working group meetings are frequent or called on short notice. There is also variation in the lead office's actual dependence upon the working group; many lead offices perform the work themselves and look to the working group for largely passive review, and some rely more heavily on the contribution of working group members.

The working group is instructed to maintain a documentary file in the course of rule making in order to facilitate compilation of the formal "administrative record" if the regulation is challenged in the courts. Past practice, however, has incurred criticism from those seeking later to define or review the formal record.

The working group is also charged to carry out the lead office's approved plans for outside participation, a task that has been emphasized in recent years. The current draft manual directs the group to "actively solicit the views of the Congress, the interested public including environmental and consumer groups, State and local governments, Federal Agencies, professional associations and regulated parties."

STEERING COMMITTEE CLEARANCE

An average of 10 months after formation, a working group wins clearance of its regulatory package for a proposed rule from the EPA Steering

Committee, which consists of senior representatives of the six Assistant Administrators and the Office of General Counsel.

The regulatory package submitted for clearance is to contain:

- a draft Notice of Proposed Rulemaking for publication in the *Federal Register*,
- an Environmental Impact Statement (required for approximately one-third of all Steering Committee items),
- an Economic Impact Analysis (required under Executive Order 11821 for between one-third and one-half of all Steering Committee items), and
- an "action memorandum" addressed to the Administrator, which includes a recommended decision.

The action memorandum is the apparent capstone of the working group's effort. It is not to exceed two pages in length and should conform to the format shown in Attachment C.1 at the end of this Appendix.

The Steering Committee itself appears to act more as an appellate body than a deliberative legislative organ, in that it only rarely conducts intensive review of working groups' efforts. In our Paper Trail sample, for example, there was formal Steering Committee discussion of working group packages for only a third of the cases, and, generally, outright rejection of a package is rare. This does not imply, however, that the Steering Committee is insignificant, for the mere possibility of disapproval frequently causes differences to be resolved at the staff level before formal submission of a working group package. Theoretically, a lead office can circumvent the Steering Committee and appeal directly to the Administrator if nettlesome issues stymie a regulation, but this remedy is infrequently needed; it occurred in but one of the decisions reviewed in the Paper Trails study.

INTERAGENCY REVIEW

Following clearance by the Steering Committee, most proposed regulations immediately enter a round of review by other interested federal agencies and must then be cleared by OMB before they can be published in the *Federal Register*. (Waiver of this requirement by OMB can be requested in particular cases, but in FY 76 over 90 percent of all items passing through the Steering Committee were subjected to interagency review.)

In January 1977 the Agency indicated that it would no longer participate in interagency review, which had been imposed at the instigation of OMB Director Shultz in 1971. (Interagency review is discussed in more detail in Chapter 4, Section H of this report.)

Generally, EPA regulations have attracted less than charitable review comments from other federal bodies, but this has usually not necessitated capitulation by EPA. Interagency review provoked substantive changes in only three decisions in the Paper Trails sample. On the average, OMB clearance has come eight weeks after a regulation enters review. However, a significant fraction have been held for much longer.

PUBLIC COMMENT

Six weeks after OMB clearance, on average, the proposed rule appears in the *Federal Register*, and formal comments are requested from all interested parties. Normally the public comment period is 60 days. Despite any earlier attempts to obtain the views of affected groups, this notice-and-comment device usually reveals issues that require further resolution, as was the case in three quarters of the Paper Trails decisions. The Agency expects fewer disruptions at this stage, however, when its recent steps to open the early stages of rule development to outside parties take effect.

At the close of the public comment period the typical regulation recycles to the working group for preparation of a final rule.

PROMULGATION OF THE FINAL RULE

It normally takes six months for the working group to rework the regulation and gain Steering Committee clearance, then seven weeks for interagency review, and then seven more weeks between OMB clearance and publication of the Notice of Rulemaking in the *Federal Register*.

A summary of the major checkpoints and associated intervals is presented in Attachment C.2. Data were gathered by EPA for a sample of about 20 representative decisions.

FURTHER DEVELOPMENTS

Promulgation of an EPA regulation is not tantamount to implementation, for a number of obstacles to ultimate compliance still remain. The most obvious of these is appeal to the appropriate reviewing court by the regulated dischargers, environmental groups, or both. Even when EPA's decision is sustained in court, its effect is often delayed pending judicial reviews. In addition, a small number of published regulations (for instance, parking controls) have been effectively reversed by later political opposition. Less apparent than these obstacles, but no less significant, is the possibility that the EPA, state, or local authority charged to implement a regulation lacks either the interest or resources to do so.

The foregoing review of formal procedures should not be taken as a picture of how EPA decisions are actually made. The procedures manual implies decision making that is structured, collegial, passionless, and synoptic; as would be expected, most of the actual interaction between the writers of a new EPA regulation and other inside and outside groups is necessarily informal, non-collegial, incremental, and sometimes contentious. The importance of the formal Steering Committee system is that it provides some safeguards for sound decision making. Two general observations are warranted.

First, the Steering Committee procedures facilitate the systematic examination of new policy by all interested parts of EPA without encumbering the Agency in a procedural straitjacket. When the stipulated procedures are followed, there is an opportunity, if not an assurance, that the assumptions, facts, and analyses supporting a new EPA rule will be made explicit and scrutinized by informed experts. EPA has retained flexibility both to expedite rule making when necessary and to suspend action in order to gather necessary additional facts and expert opinion.

Second, the Steering Committee procedures have helped foster openness in the drafting of EPA regulations. We found, for instance, that some type of public meeting was held in two-thirds of the Paper Trails cases. Furthermore, three-fourths of the decisions entailed involvement of some type of outside advisory group, usually by a standing group that either has a statutory charter, or, more often was established at the Agency's own initiative. (The Science Advisory Board, however, was involved in only one instance.) EPA is now introducing two further measures to solicit outside participation: (1) more systematic use of the Advance Notice of Proposed Rulemaking to obtain external views very early in the rulemaking process, and (2) the periodic *Federal Register* publication of lists of all rules being developed within EPA and the name of a contact person for each rule.

OTHER REGULATORY DECISIONS

In addition to its procedures for developing particular regulations, EPA operates routine procedures for the management of ongoing programs. The most significant of these, of course, is the establishment of budgets; three other activities that impinge on regulatory decision making are discussed below:

PLANNING AND PROGRAM STRATEGIES

Each major program office is required by Agency policy to prepare a long-term strategy document and to update it regularly. The analytic quality of these papers, and the procedures used to compile them vary considerably among the program offices. There has been recent emphasis on making the production of these documents more systematic and open. In November 1976 EPA published a *Federal Register* notice that draft strategy documents were available for outside review for EPA programs for air pollution control, noise abatement, radiation, and drinking water, and that similar drafts would be released for water quality, solid wastes, pesticides, and toxic substances. The Agency intends to incorporate responses to public comments in a set of final strategy documents that, upon acceptance by the Administrator, will be adopted as the EPA strategy.

INTERMEDIA PRIORITIES FOR PROGRAM GUIDANCE

Beginning in FY 76, EPA has developed lists of priority program elements as a part of its annual program guidance. Originally restricted to regional office activities, the intermedia priorities for FY 78 include headquarters priorities as well. Development of the intermedia priorities list involves extensive discussion among the major headquarters offices, the EPA regional offices, and representatives of state pollution control agencies. The list of intermedia priorities for FY 77 is shown in Attachment C.3.

FORMAL PROGRAM REPORTING

EPA operates a management-by-objectives system to coordinate regional operations. A total of 98 "output units" and 100 "activity indicators" are used, each a quantitative measure. For each output unit, a regional office annually commits itself to a specified level of yearly achievement and to intermediate milestones. Attachment C.4 presents the full set of report categories for FY 77. Attachment C.5 is a sample printout from a headquarters progress summary for the EPA report category covering regional actions under the water program's industrial permit system.

ATTACHMENT C.1 Format of EPA Action Memorandum

SUBJECT: (Title of Proposed Action) Action Memorandum

FROM: (Lead Office)

TO: The Administrator, (A-100)

THRU: AX, (A-101)

Purpose (A brief statement of the purpose and major provisions of the regulation.)

Major Issues (Outline significant alternatives considered and issues resolved during the development of the regulation. This summary should be limited to a few sentences with additional detail provided in the attachments.)

Economic Impacts (Summarize estimated capital and annualized costs, include significant reporting requirements.)

Resource Implications (Summarize resource requirements for EPA and State/Local Agencies.)

Public Participation (Summarize public involvement in the development of the regulation.)

Anticipated Reactions (Indicate plans for announcement of the action and anticipated reactions.)

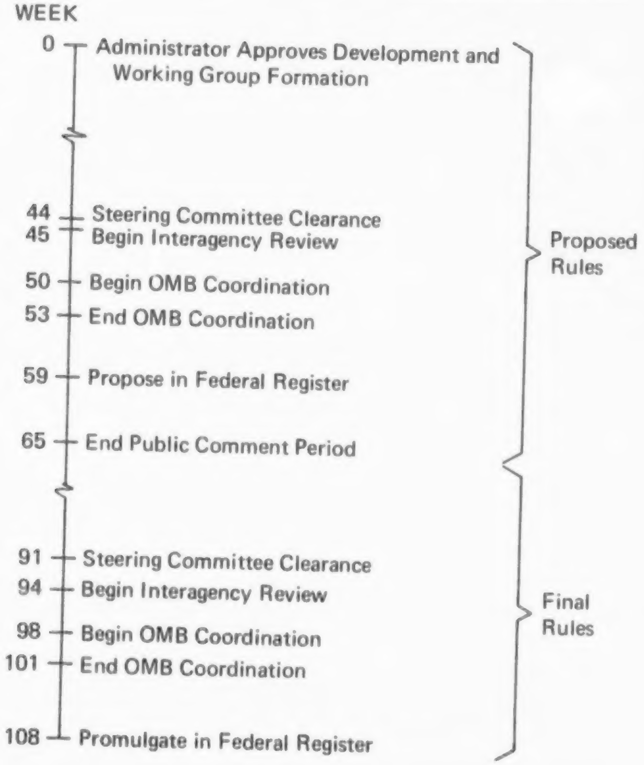
Recommendation

Attachments (As appropriate to provide an understanding of the proposal and its background)

A. Analysis of Alternatives
B. Environmental Benefits (EIS if prepared)
C. Economic and Energy Impacts (EIA if prepared)
D. Reports Impact Analysis
E. Resource Requirements
F. Summary of Interagency Comments (added after Interagency Review)
G. Steering Committee Report (added after Steering Committee Review)
H. Other Attachments

SOURCE: EPA Draft Manual for the Development of Regulations, January 1977, Chapter 3, pp. 11 & 12.

ATTACHMENT C.2 Steps in EPA regulation and development and associated intervals.


WEEK
0 Administrator Approves Development and Working Group Formation
44 Steering Committee Clearance
45 Begin Interagency Review
50 Begin OMB Coordination
53 End OMB Coordination
59 Propose in Federal Register
65 End Public Comment Period
91 Steering Committee Clearance
94 Begin Interagency Review
98 Begin OMB Coordination
101 End OMB Coordination
108 Promulgate in Federal Register
Proposed Rules
Final Rules

SOURCE: U.S. EPA Standards and Regulations Evaluation Division, January 1977.

ATTACHMENT C.3 Intermedia Priorities For 1977

I. First Priority National Objectives

1. Attain and maintain the National Ambient Air Quality Standards for the criteria pollutants by achieving compliance with SIP regulations. These regulations should be reviewed and revised as appropriate.
2. Manage the Construction Grant Program so that maximum water pollution abatement is achieved; funds are obligated according to schedule; environmentally sound, cost-effective treatment works are constructed; and the fiscal integrity of the program is protected.
3. Assure compliance by major dischargers with NPDES permit compliance schedules; To complement the Construction Grants Program, reissue or modify those major municipal permits for dischargers with inadequate treatment. Conduct O & M inspections and follow-up actions to assure compliance by POTW's with permit conditions and develop effluent limitations for dischargers with inadequate treatment.
4. Assist States in achieving primary enforcement responsibility for water supply management programs leading to the attainment of the National Drinking Water Standards.
5. Provide assistance to State and area-wide water quality management agencies (208 agencies) to assure adequate and timely performance in the development of the water quality management process, with special attention on the area of non-point sources; and ensure that Regional/State resources devoted to managing the "208 program" are adequate.

II. Second Priority National Objectives

1. Ensure that new sources of air and water pollution meet all applicable requirements so that the quality of the environment is not significantly degraded by their presence.
2. Assure that the release of toxic and hazardous pollutants is controlled by writing effective NPDES permits, by enforcing NESHAPS regulations, and by revising inadequate water quality standards.
3. Ensure that every State has an adequate program to certify applicators and to register pesticides for special local needs, and encourage States to cooperate with the enforcement of FIFRA.
4. Review EIS's prepared by other agencies, concentrating on projects with the greatest potential environmental impact, including especially EIS's on nuclear facilities.

III. Third Priority National Objectives

1. Assure that the States review existing water quality standards to ensure that the 1983 goals of fishable and swimmable waters will be met where attainable.
2. Maintain capability to respond to major environmental emergencies such as air pollution alerts, oil and hazardous materials spills, and cases of imminent hazard to drinking water, including enforcement where appropriate. When such an emergency arises, of course, response becomes the highest priority.
3. Review Corps of Engineers dredge and fill permits, focusing on those which are most environmentally significant, and assist the Corps in developing general permits.

ATTACHMENT C.3 (Continued)

4. Encourage the proper formulation, use, and application of pesticides by enforcing registration and labelling requirements and providing technical and educational assistance.
5. Promote State activities to plan and implement the proper disposal of hazardous wastes.

As I indicated earlier, this list is *not* inclusive of all Regional activities. It ranks *major* Regional responsibilities in the context of National program priorities. It is erroneous to think that simply because an item does not appear on this list, that it is not worth doing. There are many additional important objectives which must also be accomplished.

Activities Which Support the Highest Priorities

The listing of intermedia priorities does not explicitly include activities which support the accomplishment of the highest priorities, such as assuring adequate quality control in the collection of environmental and compliance data. All of our program objectives depend on the maintenance of an adequate data base. Consequently, the upgrading of air and water monitoring efforts at all levels is critical to the accomplishment of all of our programmatic objectives. Another very important activity is effective communications and public affairs efforts to gain understanding and support for the Agency's programs.

Similarly, each Region should ensure that sufficient resources are devoted to equal employment opportunity and Civil Rights programs and to those activities necessary to good management, such as economic analysis, program evaluation, and manpower training and development. Moreover, in cases where States have assumed operational responsibility for programs, the Regions must make allowance for oversight and quality assurance of the delegated activity.

SOURCE: EPA FY 1977 Regional Operating Guidance from Deputy Administrator John Quarles to Regional Administrators, 2/18/76, pp. 3-5.

ATTACHMENT C.4 Regional Guidance Outputs Summary

Water

Output Title:	1.	Municipal Construction	
Output Units:		A.	# of new Step 1 awards (Q, By S)
		B.	# of new Step 2 awards (Q, By S)
		C.	# of new Step 3 awards (Q, By S)
		D.	Total Estimated Obligations (Q, By S)
		E.	# of Step 1 projects completed (Q, By S)
		F.	# of Step 3 projects completed (Q, By S)
		G.	# of Step 3 projects completed (Q, By S)
Activity Indicators:		1.	Total PL 92-500 Project Outlays (Q, T)
Output Title:	2.	NPDES Permits	
Output Units:		A-D	# of permits issued or reissued (includes new sources), Major & Minor Municipals & Non-municipals (Q, By S)
		E.	# of major municipal permits modified, Major Municipals, (SA, By S)
Activity Indicators:		1&2	# of dischargers identified that must have a permit, Major, Municipals & Non-municipals (SA, By S)
		3&4	# of permits issued and in effect, Major Municipals & Non-municipals (SA, By S)
		5.	# of major, non-municipal permits modified (SA, By S)
		6.	# of major, non-municipal permits for which modification is requested (SA, T)
		7.	# of major non-municipal permits for which modification is denied (SA, T)
Output Title:	3.	Compliance Monitoring and Enforcement	
Output Units:		COMPLIANCE MONITORING	
		A-D	Reconnaissance inspections, Major Municipals & Non-municipals (Q, E&ST)
		E-H	Sampling inspections, Major Municipals & Non-municipals (Q, E&ST)
		I-H	Permittees in compliance with final effluent limitations, Major Municipals & Non-municipals (Q, T)
		K-L	Permittees in compliance with construction schedules, Major Municipals & Non-municipals (Q, T)
		M.	Permittees in compliance with permit conditions, Major Municipals (Q, T)
		ADJUDICATORY HEARINGS	
		N.	Unresolved requests (Q, E)
		ENFORCEMENT	
		O-P	Notices of violations, Major Municipals & Non-municipals (Q, By AS)

ATTACHMENT C.4 (Continued)

		Q-R	Administrative Orders, Major Municipals & Non-municipals (Q, E)
		S-T	309 Referrals, Major Municipals & Non-municipals (Q, E)
Activity Indicators:		1-4	Permittees in violation with final effluent limits, Major Municipals & Non-municipals (Q, E&ST)
		5-8	Permittees in violation with construction schedules, Major Municipals & Non-municipals (Q, E& ST)
		9-10	Permittees in violation with permit conditions, Major Municipals (Q, E&ST)
		11&12	NPDES violations referred by State, Major Municipals & Non-municipals (Q, By S)
Output Title:	4.	Construction Grants EIS's	
Output Units:		A.	# of final EIS's filed with CEQ (Q,T)
Activity Indicators:		None	
Output Title:	5.	New Sources EIS's	
Output Units:		None	
Activity Indicators:		1.	# of new source applications received (SA, T)
		2.	# of final EIS's filed with CEQ for new source NPDES permits (SA, T)
		3.	# of new source permits denied because of adverse environmental effects (SA, T)
		4.	# of negative declarations on new source NPDES permits (SA, T)
Output Title:	6.	Federal Facilities (Water)	
Output Units:		A.	Annual on-site inspections of major and minor sources either reconnaissance or sampling (SA, T)
Activity Indicators:		1.	# of known major Federal sources subject to NPDES including non-files (SA, T)
		2.	# of major sources out of compliance (SA, T)
		3.	# of major sources in compliance (SA, T)
		4.	# of major permits issued (SA, T)
		5.	# of minor permits issued (SA, T)
Output Title:	7.	Water Quality Management Planning	
Output Units:		A.	# of State and areawide planning agencies with all relevant interim outputs completed (SA, T)
		B.	# of States in which the water quality standards review and revision process required by section 303(c) has been completed by the State and any revisions have been approved by EPA (Q, T)
		C.	# of State and areawide planning areas that have selected Best Management Practices for appropriate key outputs of the plan (SUSPENDED UNTIL FURTHER NOTICE.) (SA, T)

ATTACHMENT C.4 (Continued)

D. # of areawide plans which have been submitted to the State for pre-adoption review (SA, T)
E. # of Phase I Basin Plans adopted by the State and approved by EPA (SA, T)

Activity Indicators:
1. # of State and areawide planning areas with regulatory programs (SA, T)
2. # of State and areawide planning areas which have identified management agencies. (SA, T)

Output Title: 8. Water Monitoring
Output Units:
A. # of State Laboratories evaluated (SA, T)
B. # of NWQSS stations with current data (Q, T)

Activity Indicators:
1. # of State quality assurance programs (SA, T)
2. # of State monitoring strategies (SA, T)
3. # of data transfer & STORET agreements (SA, T)

Output Title: 9. Municipal Operations
Output Units:
A. # of municipal O&M inspections (Q, T)

Output Title: 10. Oil and Hazardous Substances
Output Units:
A. # of SPCC plan inspections (SA, T)

Activity Indicators:
1. # of cases referred to Coast Guard for prevention action (SA, T)
2. # of cases referred to EPA for violation (SA, T)
3. # of spills requiring removal action by EPA (SA, T)
4. # of spills removal actions monitored by EPA (SA, T)
5. # of SPCC Plan Amendment field inspections (SA, T)

Output Title: 11. Ocean Dumping
Output Units: None

Activity Indicators:
1. # of dump site applications (SA, T)
2. # of dump site permits (SA, T)
3. # of enforcement actions (SA, T)

ater Supply

Output Title: 1. Water Supply
Output Units:
A. # of Public Water System State grants (A, T)
B. # of Public Water System primacy determinations (Q, T)
(C&D suspended until further notice)
C. # of UIC grants (A, T)
D. # of UIC primacy determinations (Q, T)

FA

Output Title: 1. EIS Review
Output Units:
A. % of draft EIS's with pre-draft liaison (SA, T)
B. % of EIS's reviewed on time (SA, T)

ATTACHMENT C.4 (Continued)

Activity Indicators:		1.	# of draft EIS's reviewed (SA, T)
		2.	# of final EIS's rated ER, EU, or 3 as draft (SA, T)
		3.	# of draft EIS's rated ER, EU, or 3 with pre-final consultation (SA, T)
Output Title:	2.	Manpower Development and Training	
Output Units:		None	
Activity Indicator:		1.	Ratio of State environmental training needs funded to the State planned needs
Air			
Output Title:	1.	AQCR Status Report	
Output Units:		A.	Completion of status report (Q, By S)
Activity Indicators:		None	
Output Title:	2.	SIP Emission Limitations in Non-attainment AQCR's	
Output Units:		A.	# of major sources in compliance (Q, T)
		B.	# of major sources in violation (Q, T)
		C.	# of major sources of unknown status (Q, T)
		D.	# of minor sources in compliance (Q, T)
		E.	# of minor sources in violation (Q, T)
		F.	# of minor sources of unknown compliance status (Q, T)
		G.	# of major sources inspected (Q, E and ST)
		H.	# of minor sources inspected (Q, E and ST)
		I.	# of enforcement actions (Q, T)
Activity Indicators:		1.	# of formal inquiries sent (Q, E and ST)
Output Title:	3.	Major Source SIP Emission Limitations Compliance	
Output Units:		A.	# of major sources in compliance with SIP standards (Q, By S)
		B.	# of major sources of unknown compliance status with respect to SIP standards (Q, By S)
		C.	# of major sources in violation of SIP standards (Q, By S)
		D.	# of major sources in compliance with scheduled increments of progress (Q, By S)
		E.	# of major sources of unknown compliance status with respect to scheduled increments of progress (Q, By S)
		F.	# of major sources in violation of scheduled increments of progress (Q, By S)
		G.	# of major facilities inspected (Q, E & By S)
		H.	# of enforcement actions taken by EPA (Q, By S)
Activity Indicators:		1.	# of formal inquiries sent (Q, E & By S)
		2.	# of field surveillance actions taken (Q, E & By S)
		3.	# of notices of violation issued (Q, E & By S)
		4.	# of abatement orders issued (Q, E & By S)

ATTACHMENT C.4 (Continued)

5. # of civil/criminal proceedings initiated (Q, E & By S)

Output Title: 4. FEA Combustion Source Prohibition Compliance
Output Units: None
Activity Indicators: 1. # of sources for which administrative process is complete (Q, T)

Output Title: 5. NSPS Compliance
Output Units: A. # of operating sources in compliance (Q, T)
B. # of operating sources of unknown compliance status (Q, T)
C. # of operating sources in violation (Q, T)
D. # of sources inspected (Q, E&ST)
E. # of States delegated enforcement of NSPS (Q, T)
F. # of enforcement actions taken by EPA (Q, T)
Activity Indicators: 1. Number of enforcement actions taken by all States in Region (Q, ST)
2. # of NSPS sources for which construction has commenced (Q, T)

Output Title: 6. New Source Construction
Output Units: A. # of State permits audited by EPA (Q, T)
Activity Indicators: 1. # of permits issued by all States (Q, ST)
2. # of permits issued by EPA (Q, E)

Output Title: 7. Significant Deterioration
Output Units: None
Activity Indicators: 1. # of source reviews completed (SA, E)

Output Title: 8. Fuel Additive and Vapor Recovery Regulations
Output Units: A. # of unleaded fuel inspections (Q, T)
B. # of unleaded gasoline samples tested (Q, T)
C. # of Stage I vapor recovery inspections (Q, T)
Activity Indicators: 1. # of contaminations detected (Q, T)
2. # of administrative complaints issued (Q, T)
3. # of notices of violation issued (Q, T)
4. % of facilities in compliance with Stage I regulations (Q, T)
5. % of facilities in compliance with Stage II regulations (Q, T)
6. # of enforcement actions taken by states (Q, T)
7. # of §113 notices of violations issued (Q, T)

Output Title: 9. Federal Facilities Compliance
Output Units: A. # of on-site inspections (Q, T)
Activity Indicators: 1. # of major sources in compliance (Q, T)
2. # of major sources in violation (Q, T)

ATTACHMENT C.4 (Continued)

3. # of major sources of unknown compliance (Q, T)
4. # of major sources covered by current consent agreements (Q, T)

Output Title: 10. Compliance with NESHAP Requirements
Output Units:
A. # of sources subject to NESHAPS (Q, T)
B. # of sources in compliance (Q, T)
C. # of sources inspected (Q, E&ST)
D. # of enforcement actions taken by EPA (Q, E)
E. # of State delegations (Q, T)
Activity Indicators:
1. # of enforcement actions taken by States (Q, ST)

Output Title: 11. Air Pollution Data
Output Units:
A. # of State labs meeting quality assurance criteria (Q, T)
Activity Indicators:
1. # of State labs visited (Q, T)
2. # of State programs for evaluation of lab capability (Q, T)

Output Title: 12. Air Quality Data of NAAQS
Output Units:
A. # of pollutant monitors (Q, T)
Activity Indicators:
1. # of monitors visited and evaluated (Q, T)

Output Title: 13. Accurate emissions Inventories
Output Units: None
Activity Indicators: None

Output Title: 14. Reports on Ambient Air Quality Data
Output Units: None
Activity Indicators None

Pesticides

Output Title: 1. State Certification Programs Output Units
Output Units:
A. # of States with operating certification programs (Q, T)
Activity Indicators:
1. # of private applicators certified (A, By S)
2. # of commercial applicators certified (A, By S)
3. # of private applicators trained (A, By S)
4. # of commercial applicators trained (A, By S)

Output Title: 2. Cooperative Enforcement Programs
Output Units:
A. # of States involved in cooperative programs (SA, T)
Activity Indicators:
1. # of producer establishments inspected (SA, By S)
2. # of samples collected at establishments (SA, By S)
3. # of marketplace samples collected (SA, By S)
4. # of foreign import products sampled (SA, By S)

ATTACHMENT C.4 (Continued)

5. # of use, reentry, experimental use investigations (SA, B)

Output Title: 3. Sections 24(c) and 5(f)
Output Units: A. # of States with Section 24(c) programs (Q, T)
B. # of States with Section 5(f) programs (Q, T)
Activity Indicators: None

Output Title: 4. Industry Compliance with Registration
Output Units: A. # of producer establishments inspected (Q, T)
B. # of import investigations (SA, T)
C. # of marketplace investigations (SA, T)
Activity Indicators: 1. Number of product labels reviewed at establishment (Q, T)
2. Number of producer establishment samples collected (Q, T)
3. Number of section 9(c) warnings resulting from establishment inspection activities (Q, T)
4. Number of civil complaints resulting from establishment inspection activities (Q, T)
5. Number of import entries reviewed (Q, T)
6. Number of foreign import samples collected (Q, T)
7. Number of import detentions (Q, T)
8. Number of marketplace samples collected (Q, T)
9. Number of section 9(c) warnings resulting from marketplace activities (Q, T)
10. Number of civil complaints resulting from marketplace
11. Number of criminal prosecutions resulting from all product violations (SA, T)
12. Number of stop sale, use or removal orders resulting from all product/producer violations (SA, T)
13. Number of recalls initiated (SA, T)
14. Number of samples forwarded for chemical analysis (Q, T)

Output Title: 5. Compliance with Label Direction
Output Units: A. # of experimental use observations (Q, T)
B. # of use and reentry observations (Q, T)
Activity Indicators: 1. Number of experimental use permits monitored (Q, T)
2. Number of section 9(c) use warnings issued (SA, T)
3. Number of section 14(a)(2) warnings issued (Q, T)
4. Number of civil complaints resulting from use activities (SA, T)

ATTACHMENT C.4 (Continued)

5. Number of cases referred to U.S. attorney on criminal prosecutions resulting from use activities (SA, T)
6. Number of stop sale, use, or removal orders and seizures from use activities (SA, T)

Output Title: 6. Integrated Pest Management
Output Units: None
Activity Indicators: None

Output Title: 7. Accident Control Programs
Output Units: A. # of States with accident control program (A, T)
Activity Indicators: None

Solid Waste

Output Title: 1. Control of Land Disposal Sites
Output Units: A. # of States assessed (A, By S)
Activity Indicators: None

Output Title: 2. Federal Agency Compliance
Output Units: None
Activity Indicators: None

Radiation

Output Title: 1. Review of EIS's
Output Units: A. # of EIS reviews completed for conventional nuclear facilities (SA, T)
Activity Indicators: None

Noise

Output Title: 1. State Legislation
Output Units: A. # of plans to be developed (A; T)
Activity Indicators: None

Key to Abbreviations:

Frequency -
Q - Quarterly
SA - Semi-Annually
A - Annually

Reporting Units -
T - Total for Region Including State lead activity
E - Total for Region exclusive of State lead activity
ST - One total for all States' activities
By S - State-by-State reporting
BY AS - By approved (NPDES) State reporting

SOURCE: EPA FY 77 Regional Operating Guidance from Deputy Administrator John Quarles to Regional Administrators, 2/18/76, page ix-xiii.

ATTACHMENT C.5 Sample Page From EPA 'Formal Reporting System' Progress Summary.

Water NPDES Permit Issuance and Compliance– Nonmunicipal	Regions										
	01	02	03	04	05	06	07	08	09	10	Total
No. recon inspecs of major (non-muni) permittees by EPA											
Commitment	100	130	60	474	128	180	83	31	82	35	1303
Milestone	75	100	46	399	96	128	70	24	55	26	1019
To Date	42	75	17	158	5	112	80	16	61	20	586
Percent to Date	42	58	28	33	4	62	96	52	74	57	45
No. sampling inspecs of major (non-muni) permittees by EPA											
Commitment	40	140	110	80	66	64	38	91	9	20	658
Milestone	30	110	85	60	48	44	28	84	7	15	511
To Date	10	97	95	59	68	50	32	66	5	23	505
Percent to Date	25	69	86	74	103	78	84	73	56	115	77
No. non-muni notices of violations issued to states-EPA by state											
Commitment	7	40	72	8	64	0	16	95	20	6	328
Milestone	4	30	61	6	50	0	12	65	12	6	246
To Date	2	0	7	1	5	0	0	30	9	1	55
Percent to Date	29	0	10	13	8	0	0	32	45	17	17
No. NPDES admin orders to dischargers by EPA											
Commitment	25	100	300	122	64	80	32	30	10	35	798
Milestone	18	75	225	96	50	55	24	20	6	27	596
To Date	32	31	11	68	28	91	5	17	12	31	326
Percent to Date	128	31	4	56	44	114	16	57	120	89	41
No. referrals by EPA to DOJ of cases involving dischargers											
Commitment	16	36	8	28	13	6	4	5	1	10	127
Milestone	12	27	6	22	10	4	3	3	1	7	95
To Date	5	6	4	24	2	5	6	10	4	3	69
Percent to Date	31	17	50	86	15	83	150	200	400	30	54
No. non-NPDES enf actions taken by EPA											
Commitment	61	165	20	116	230	200	100	75	65	15	1047
Milestone	50	120	15	87	170	150	75	50	45	12	774
To Date	53	121	85	129	271	369	109	33	84	58	1312
Percent to Date	87	73	425	111	118	185	109	44	129	387	125

Number Reconnaissance Inspections of Major Non-Municipal Permittees by EPA

Region I - A review of major permittees requiring reconnaissance inspections has been made and only 30 additional major dischargers appear eligible for visits for the remainder of the year. It is expected that only 57 visits will be conducted by 6/30/76.

SOURCE: EPA, Office of Planning and Management Program Reporting Division, Formal Reporting System Program Summary Report 3/31/76.

APPENDIX

D Quantitative Methods of Analysis

I. METHODS OF ANALYSIS

INTRODUCTION

This section will discuss three terms that are used in connection with analyses of programs in both the public and private sectors. cost–benefit analysis, cost–effectiveness analysis, and decision analysis. There is no universal agreement on specific definitions of these terms; the definitions presented here are used only to provide a basis for discussing quantitative methods of analyzing environmental decisions.

This Appendix raises and discusses a number of important technical issues involved in formalized quantitative methods of analysis. Many of the difficult analytical issues discussed here are relevant to the programs of many government agencies and are not peculiar to EPA. The methods described may be helpful to decision makers though they will often be difficult to use in a simple fashion. It should be noted that Chapter 2, Section A of the report examines the use and value of explicit analyses in decision making and concludes that evaluations should be done quantitatively, when possible and warranted, but that even where the difficulties of quantification prove insurmountable, more qualitative approaches are still likely to be helpful to decision makers.

A. COST–BENEFIT ANALYSIS[1]

Cost–benefit analysis is a procedure for comparing the costs and benefits of alternative policies. This procedure relies on specialized techniques and principles, most of which are derived from economic theory. Its purpose is to aid in the fundamental task of allocating the economy's scarce resources among alternative uses so as to enhance allocative efficiency. But allocative efficiency is only one of the considerations that policymakers take into account in evaluating proposals. For example, considerations of equity and political acceptability are also relevant and sometimes decisive.

---

[1] This section relies heavily on the discussion in Peskin and Seskin (1975:1-29).

For purposes of a cost–benefit comparison, the benefits of a proposal are defined to be the amount that people would be willing to pay for the proposal's results.[2] For example, conceptually the benefits from air pollution abatement would include the amounts people would be willing to pay for all the effects associated with cleaner air. These effects might range from lower cleaning costs and lessened plant damage to improved human health and more frequent sunny days. Some of these benefits are amenable to straightforward quantification and monetization, while others pose both conceptual and practical difficulties. These difficulties can render comprehensive benefit analysis a complex undertaking.

It is generally agreed that a useful concept of costs in a cost–benefit framework is that of opportunity costs.[3] Opportunity cost refers to the value foregone in employing a resource in one activity rather than in its best alternative use. For example, when a water pollution control program is undertaken, resources (such as the labor and materials needed to construct a sewage disposal plant) must be diverted from other uses. The value of the foregone production and consumption that results from this diversion of resources represents the opportunity cost of the control program. In addition, there may be undesired environmental, economic, or social effects that are not fully captured as part of the opportunity cost of the control program. A complete cost analysis should attempt to define these effects clearly and take them into account.

B. COST–EFFECTIVENESS ANALYSIS

For some environmental decisions, the objective may be taken as given. In such cases the policymaker can use cost–effectiveness analysis to determine the least-cost ways of achieving the set of objective. The basic difference between cost–effectiveness analysis and cost–benefit analysis is that cost–effectiveness analysis takes as given the level of beneficial outputs (objectives) whereas cost–benefit analysis can be used to examine a range of beneficial results in order to ascertain the level at which net benefits (benefits minus costs) is greatest. For example, cost–benefit analysis might be used to look at the costs and benefits of various pollution standards in order to find the "optimal" economic standard for emissions from mobile sources. A cost–effectiveness analysis, on the other hand, might be used to look at the least-cost methods of achieving prespecified emission standards.

---

[2] A detailed discussion of the concept of benefits and its related topics can be found in Section II.B of this appendix.

[3] The opportunity-cost concept, as well as other related topics are also discussed in Section II.B of this appendix.

Thus, as defined here, cost–benefit analysis and cost–effectiveness analysis are not two different approaches to the same problem. Rather each is a procedure that can be applied to a distinct set of problems. Furthermore, it might be argued that cost–benefit analysis can be used to address higher-order questions than cost–effectiveness analysis. Where cost–effectiveness analysis can be used to ask: what is the least-cost means of attaining a desired emissions standard (assuming "costs" can be unambiguously compared); cost–benefit analysis can be used to ask: what is the most economically efficient standard in the first place?

C. DECISION ANALYSIS[4]

Environmental decisions are made under conditions of uncertainty. This uncertainty may be concerned with the abundance and distribution of chemicals in the environment; the rate of diffusion of such substances in the atmosphere, water, or soil; the impact of changes in environmental quality upon human health and other organisms; the values that should be attached to possible outcomes of a decision, e.g., how to value certain health benefits or the cost assessments of yet unproven technologies; and the effectiveness of implementing a particular decision. These and other uncertainties are inherent in the problem of deciding what environmental policies to choose. Decision analysis is a technique designed to make these uncertainties explicit thereby subjecting them to discussion, debate, and modification.

Decision analysis does not supplant or make unnecessary other methods of analysis such as cost–benefit analysis or cost–effectiveness analysis. Rather, decision analysis should be looked upon as a technique for incorporating uncertainty into these other forms of analysis.

The application of decision analysis to a problem follows a well-defined sequence of steps. The first step is called the "deterministic phase." In this phase, the decision to be made is defined, i.e., the analyst poses the question: what is to be decided? Possible alternative actions are identified. The possible outcomes for each alternative action are analyzed. These outcomes are often difficult to describe, since this part of the analysis may include many elements—for example, health effects, climatic impacts, reproduction cycles of insects—that are not, in fact, completely known. Nevertheless, in this phase of the analysis, such variables are treated as if they were known accurately so that calculations can be performed to indicate how outcomes are affected by a particular decision. The values placed upon the chain of events leading from decision to outcome are assigned by the analyst. This part of the analysis is similar to a properly done cost–benefit analysis. The same problems occur in both, e.g., how to compare the value of inherently incomparable considerations such as cost of pollution abatement and public health. The deterministic model can be used to perform a sensitivity analysis to examine how the values attached to certain outcomes vary with changes in poorly known variables. In this part of the analysis, the impact of uncertainty is evaluated quantitatively. Sensitivity analysis can pinpoint those variables for which better information would be important and can also identify variables that are unimportant to the decision despite the fact that they are inexact.

---

[4] A general discussion of decision analysis can be found in Howard (1966).

The second phase of decision analysis is called the "probabilistic phase." During this phase of the analysis data are gathered on all important variables and encoded in the form of probability distributions (Howard 1966). This is probably the most controversial part of decision analysis, since the translation of poorly understood data, scarce information, and scientific opinions into probability distributions often depends on considerable subjective judgment. The advantage of decision analysis is that it forces these judgments to be made openly and subjects them to discussion. On the other hand, decision analysis is often sufficiently complex to require computer calculations and there are many who fear that this can mask the fact that subjective judgments entered in the formulation of the problem and in the assignment of important probability distributions. It should be kept in mind, however, that it is better to have a method that deals explicitly with uncertainty than to hide uncertainty in computations that carry an air of certainty unwarranted by the data.

Methods to encode knowledge, even vague knowledge, into probability distributions for use in decision analysis are treated in several references.[5]

---

[5] See, for instance Spetzler and Stael von Holstein (1972).

The third phase of decision analysis is known as the "informational phase." After the problem has been formulated, the sensitivities determined, and the knowledge encoded as probability distributions, an analysis is made comparing the expected cost of obtaining more information (on matters having broad probability distributions, i.e., those that are particularly uncertain) with the expected value of the additional information.[6] The analysis can show whether it is worth purchasing more information or whether the decision should be made with the data at hand.

D. STANDARD QUANTITATIVE METHODS AND EPA DECISIONS

It should be apparent from the above descriptions that these three methods of quantitative analysis have a potential use (and, in some cases are used) for decision making at EPA. However, each procedure, taken alone, may be inadequate for the policymaker's purposes. In part, this inadequacy arises because of weaknesses associated with the current use of the individual techniques. For example, traditionally, all three quantitative methods often neglect the distributional aspects of policy decisions. In addition, to a greater and lesser degree, the techniques are associated with difficulties in the presentation and consideration of nonmonetary and incommensurable effects. Furthermore, only decision analysis customarily treats uncertainty explicitly. Finally, it is seldom the case that marginal or incremental analyses are undertaken.

II. IMPORTANT ISSUES IN ANALYSES TO SUPPORT EPA DECISIONS

Chapter 2, Section A of the Committee report discusses general aspects of the type of analysis that could improve environmental decision making at EPA. This section of the appendix will consider in more detail some of the important issues that arise in applying these techniques to environmental decision problems.

A. STRUCTURING THE PROBLEM

Most policy decisions made by the EPA have diverse social effects: on human health; on environmental and ecological conditions; on social attitudes. Many of these effects having lingering consequences that may affect future generations. Prudent decision making must balance, at least informally, all these considerations.

---

[6] The advantage of probability distributions is that they can be combined in various ways to permit each "expert" and each source of technical information to make an explicit input to the problem, (see Section II.E.2 of this Appendix).

In most cases EPA decisions depend on a mixture of scientific, engineering, legal, political, and economic issues. The issues are complex and multifaceted, and their analysis requires the contributions of scientists, engineers, lawyers, politicians, and social scientists. In order for these diverse contributors to work together effectively, the decision problem at hand should be structured. The structuring of the decision problem can be thought of as an organized approach to:

- explicitly stating the objectives of the decision;
- identifying feasible alternatives;
- understanding the physical, chemical, medical, and ecological processes or systems;
- obtaining and organizing data;
- evaluating (quantitatively, to the extent possible) the consequences of the various alternatives;
- exploring potential problems in implementation;
- indicating and examining the degree of uncertainty associated with the alternatives; and
- presenting the information in a coherent form to facilitate decision making.

When a decision problem has been properly structured, those who have specialized talents will be able to contribute their knowledge in a constructive way.

B. BASIC CONCEPTS AND DEFINITIONS

1. Benefits and Costs

Decisions made by the Environmental Protection Agency usually involve benefits derived from enhancement of environmental quality. For example, the benefits associated with an EPA action improving water quality might include improvements in human health; reductions in water treatment costs for industrial water users; increases in sport and commercial fishery yields (for given levels of labor and capital); improvements in water recreation opportunities; reductions in household costs associated with water hardness; and increases in aesthetic values of water, based on its appearance, taste, and odor. The common element of each of these items is that it has the potential of increasing general welfare.

The costs of environmental policies normally include direct monetary expenses (operating and maintenance as well as capital) divided into private and governmental (federal, state, and local) expenditures. Such costs can represent net decreases in economic output available for all purposes other than implementing the proposed policy and are often termed "opportunity costs." At the same time, there may be additional costs in the form of undesired environmental, economic, or social effects (for example, adverse effects on land use, energy consumption, or local unemployment) that are not completely captured by the standard definition of "opportunity costs." All of these types of costs have the potential of decreasing general welfare.

In evaluating a proposed action or project, it is customary to begin by listing both anticipated benefits and costs in their most natural, or convenient, units. However, identifying the benefits and costs may be only the beginning. The policy analyst may then attempt to quantify the benefits and costs, and if possible, determine values for them.

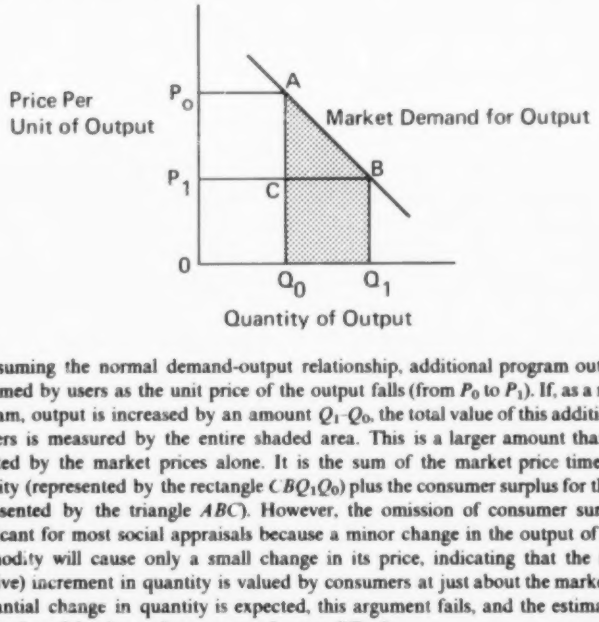
2. *The Willingness-to-Pay Concept*

The value of the results (benefits) of any government program, or of the products of any private enterprise, can be measured by the amount that the beneficiaries are willing to pay for them. In the same manner, the cost can be measured by the amount that the beneficiaries would be willing to pay for the products that the resources used by the program could have produced if they had been employed in their most valuable alternative use. (This is the basis of the concept of opportunity costs.) On both the benefit and the cost side of an appraisal, willingness-to-pay—which is shorthand for the amount that people would be willing to pay—is a fundamental concept.

Sometimes the estimation of willingness-to-pay presents no problems. This is the case when the outputs are sold and where there is reason to believe that all people who are willing to pay the established price do so and thereby obtain the quantity of the good or service that they find worthwhile. In this case, which is typical of privately produced and sold goods and services, the price is an adequate measure of willingness-to-pay. Furthermore, the prices of the resources used to produce any good or service are an adequate measure of their opportunity costs, since these resource prices reflect the value of the commodities that those resources could have produced if otherwise employed. Thus, in an economist's model world, prices measure the extra utility (or satisfaction) a consumer obtains from a unit of the good or service, as well as the cost to society of producing another unit of a good or service. When markets function well, prices are often suitable measures of the benefits and costs of the final goods and services associated with environmental decisions.[7]

Returning to the water quality example above, such benefits as reduced household costs associated with water hardness are by definition "priced" and described directly in monetary units. On the other hand, increased fishery yields are most easily described initially in terms of pounds of fish. Pricing the increased fishery yield does not pose any great conceptual problems, since markets exist that can provide relevant data. In other cases, however, it may be difficult to quantify the effects in the first place, much less to estimate the willingness-to-pay for them.[8]

[7] It should be noted that prices as measures neglect "consumer's surplus"—a surplus benefit that arises whenever a consumer is charged less for a good or service that he would be willing to pay for it. This concept is illustrated in the figure below:



Assuming the normal demand-output relationship, additional program output will be consumed by users as the unit price of the output falls (from P_0 to P_1). If, as a result of the program, output is increased by an amount Q_1-Q_0, the total value of this additional output to users is measured by the entire shaded area. This is a larger amount than would be reflected by the market prices alone. It is the sum of the market price times increased quantity (represented by the rectangle CBQ_1Q_0) plus the consumer surplus for that increase (represented by the triangle ABC). However, the omission of consumer surplus is not significant for most social appraisals because a minor change in the output of a marketed commodity will cause only a small change in its price, indicating that the (positive or negative) increment in quantity is valued by consumers at just about the market price. If a substantial change in quantity is expected, this argument fails, and the estimation of the social value of the change becomes much more difficult.

[8] This is particularly true with respect to two classes of effects common to most environmental actions: health effects and aesthetic or psychic effects. The first class will be discussed in Part C of this appendix. With regard to evaluating aesthetic or psychic effects, present state-of-the-art often limits the analyst to a simple listing of the nature of the effects. It should be noted that in the context of pollution abatement and other environmental issues, such intangible effects may represent the most important categories of benefits and costs.

One reason for this difficulty is that many effects come under the category economists term "collective" or public goods. Collective or public goods usually affect a large number of individuals simultaneously and, in most instances, each individual has little choice over the amount or quantity of the goods and services consumed.[9] The simultaneity and lack of divisibility usually preclude a market for the goods and services in question. For example, improvements in air quality associated with air pollution control programs most often affect large numbers of people over wide geographical areas. It is difficult to conceive of distributing the benefits of improved air quality on an individual basis. Furthermore, it is unrealistic to expect that these benefits will be valued in a market for clean air. Thus, the policy analyst must develop some other method for obtaining values for these effects, i.e., the analyst must devise schemes to deduce what individuals would be willing to pay for these types of benefits if the individuals were assessed for them.

Another factor that hampers the valuation of benefits associated with environmental actions is that many are difficult to predict or quantify. Furthermore, even in cases where the benefits can be predicted or quantified with some degree of accuracy, current market conditions may not be adequate for estimating values for them. For instance, in the water quality example, benefits were associated with increased recreation opportunities. However, attempts to value these benefits must first grapple with the problem of predicting the extent of the increased opportunities. Moreover, the current market demand for such recreational opportunities may provide a poor basis for estimating demand and willingness-to-pay for a new recreation site.[10] In such cases, other more elaborate estimation techniques may be needed.

3. Valuation of Employed and Unemployed Resources

Returning to the water quality example, suppose that the environmental program leading to the water quality improvement also results in the construction of lodging and eating facilities around the lake. The question is: how should the policy analyst evaluate these secondary effects of the water quality improvement? The answer to this question depends in large part on the employment conditions in the economy. If the economy is assumed to be fully employed, there may be little basis for considering the increased restaurant and hotel activity as significant secondary benefits. This follows from the fact that in a full-employment economy, there are essentially no idle resources. Hence, construction of hotels and restaurants necessitates the diversion of resources from another sector of the economy and some other activities must be foregone or, at least, reduced. Thus, under fully-employed conditions, there is a presumption that secondary effects involving resource use will not generally represent significant additions to aggregate welfare.[11]

---

[9] The most common example of a public good is national defense.

[10] A related issue concerns the interdependence between willingness-to-pay and the distribution of income. That is, the policy analyst must recognize that the amount people are *willing* to pay depends, in part, on their *ability* to pay. Thus, the value attached to project benefits given one distribution of income, can be appreciably different than the value of the same project benefits given another distribution of income. In addition, if the project itself significantly alters the distribution of income, the analysis is further complicated. In particular, the extent of the distributional impact on incomes must first be evaluated. Hence, the policy analyst is faced with a somewhat paradoxical situation. Although the valuation of benefits using willingness-to-pay must be thought of as dependent on the distribution of income, any specific valuation of benefits must be based on assuming that a particular distribution of income is given.

If the economy is experiencing significant unemployment—nationally or regionally—or if there are obstacles to resource mobility, the valuation of secondary effects will be different.[12] Then the additional resources used because of the water quality improvement will not be simply transferred from alternative employment. Thus, in the example above, if the restaurant and hotel construction employs resources that would have otherwise been idle, then this would represent a significant secondary effect. Moreover, it should be considered an increase to aggregate welfare and, hence, a benefit in the evaluation of the action leading to the water quality improvement.

C. VALUATION OF HEALTH EFFECTS

1. Introduction

Because most EPA policies and programs are designed primarily to protect and improve human health, it is useful to give special attention to the valuation of health effects. Any assessment of the effects on health of an action by EPA depends on a long chain of consequences: the changes in pollution-generating activities induced by that action, the changes in polluting discharges resulting from those changes in activities, and others. Each link in this chain presents difficult scientific problems.

---

[11] If resources are diverted from one sector of the economy to another, this implies at least an incremental gain in aggregate welfare since the costs of transferring the resources must be incurred. However, it is usually difficult to measure empirically this marginal welfare gain. At the same time, if the shifted resources are more productive in their new activities, this also represents a gain in aggregate welfare. Again, in practice, it is difficult to prove such a gain in productivity has occurred.

[12] Here, it is assumed that the unemployment or resource immobility will continue for the life of the project.

For example, in evaluating the health effects from air pollution abatement, assessments must rely on a determination of the relationship between improved ambient air quality and changes in the morbidity (including disability and absence from work and school) and the mortality of the exposed population.[13] The basic problem in investigating the air pollution-health relationship is isolating the effects of air pollution from the effects of numerous other factors that determine the status of human health. These include physical, socioeconomic, and personal characteristics such as age, sex, race, income, smoking habits, exercise habits, genetic history, nutritional history, and medical care, as well as other environmental factors, such as climate. Thus, the first task is to determine how air pollution levels affect morbidity and mortality rates, given all of these confounding factors. If, and when, this association can be ascertained, the policy analyst can then translate the effects into a useful measure, e.g., reduced work-days lost, reduced days of restricted activity, and so on. Finally, it may be desirable in some cases to go one step further by assigning values to such health effects.

2. *Techniques for Valuing Lives*

It is the purpose of this section to review briefly the various techniques that have been proposed for valuing life and health in monetary terms.[14] No single technique has gained wide acceptance but each has its advocates and several have, in fact, been used for the purpose of carrying out cost–benefit analysis, and arriving at decisions, on major public programs.[15]

A major difficulty in valuing lives (or health) stems from the fact that life has no market price. Under nearly all conceivable conditions, no sum of money is sufficient to compensate persons for loss of their lives; lives cannot be bartered and are obviously qualitatively different from

[13] For simplicity we are neglecting the difficult problem of determining the association between reduced air pollution emissions and their precise effects on ambient air quality.

[14] This section is taken from Raiffa, H., W. Schwartz, and M. Weinstein (1976) On Evaluating Health Effects of Societal Programs; prepared for the Committee on Environmental Decision Making.

[15] The literature that is reviewed here discusses the monetary value of a *life* and not of a *life-year*. Hence, this section will be limited to a consideration of lives rather than life-years.

commodities that society produces. In an attempt to circumvent this difficulty, two major strategies have been employed. The first employs one or another technique to determine the dollar value that should be placed on a life that is lost. For such an assessment, the most commonly used measure is so-called human capital. The second strategy is radically different in that it attempts to estimate the dollar value that should be assigned to some given statistical reduction in the probability of death or illness. It, in effect, focuses on the value of *life-saving* rather than the *value of a life*.[16] The most widely discussed method for obtaining such values depends on an assessment of the individual's willingness-to-pay for a public program involving some statistical improvement in the person's outlook for survival or health.

a. *Human Capital* Human capital is the indicator most widely used to estimate the value of life. It is calculated on the basis of projected future (present value) earnings, taking into account the age, sex, and education of the particular individual. Human capital thus measures an individual's worth in terms of what the person can produce.

Some who favor the human-capital criterion advocate the use of the net value of the earnings stream whereas others favor the use of gross value. *Net value* appraises a person in terms of the resources that the rest of society would lose if the individual were to die. This number is arrived at by subtracting the individual's anticipated (discounted) consumption from the individual's anticipated (present value) earnings. In effect, the calculation views individuals as having worth only to the extent that they contribute to the rest of society, excluding themselves. Although *net value* fairly represents direct economic losses that would be suffered by an individual's survivors, it has been severely criticized because it ignores the value of life to the individual who has died or who is a potential decedent. The net value calculation seems to say that the specific individual does not count, an attitude which ignores the fact that society exists so that people can enjoy life. Concern over this implication has led most advocates of human-capital measures to favor the use of gross rather than net values in the analysis of public programs. *Gross value*, because it includes the individual's consumption, eliminates the objection that the satisfactions which accrue to the specific person have been neglected in the accounting process.

---

[16] The issue of how to treat the valuation of future life-saving is treated in Section II.D.4 of this appendix.

Note, incidentally, that the classic human-capital estimate does not include any of the nonpecuniary losses that follow from an individual's death, despite the fact that such losses may loom large in terms of their social impact. The grief that is caused to a family, the loss of the individual's contribution to home duties, and the effects on the individual's friends, employer, and community are all examples of costs that may not be reflected in the human-capital measure. To provide a more comprehensive measure of the individual's contributions, it has been proposed that these factors be taken into account, with appropriate monetary values being assigned to each.

Beyond the technical criticisms of human-capital measures just discussed, there lie more basic philosophical objections to the very concept of human capital as a measure of social benefit.

One source of serious concern has been that the human-capital estimate distorts social attitudes toward human life. For example, any valuation based on earnings stream would lead to the conclusion that retired people, or those unable to work, are either of no value to society or (if net value is used as an indicator) that they represent an actual drain on the community. The logical corollary is that a public investment in saving the lives of such individuals is not justified and that in fact society would be better off if they were allowed to die. This formulation in no way conforms to society's views and is in fact repugnant as a concept. A second, and equally repugnant, conclusion, that follows inevitably from application of the human-capital measure, is that a high wage earner is worth more to society than a low wage earner. This means that in assessing the benefits of any public program in terms of earnings stream, the evaluation would consider an individual earning $30,000 to be worth as much as 3 individuals earning $10,000 each.

A most serious and fundamental criticism, however, lies in another area and can be summarized as follows: human capital does not consider the desire (demand) of the individual for survival. In other words, by using human capital as the index of benefits, society ignores the desire of individuals to improve their chances of survival.[17]

b. *Other Approaches* Several attempts have been made to obtain society's *implicit appraisal* of the value of a life through an analysis of investment in existing public programs that have an impact on survival.

---

[17] Despite these many objections, human-capital estimates have been used repreatedly in recent years in the analysis of a number of programs involving safety. The values that have been employed have typically been in the range of $150,000 to $250,000 per life saved.

Studies of investments in both highway safety and airline safety have indicated that there is an enormous range of investment per life saved—the implicit value of a life ranging from only a few thousand dollars to a million dollars or more.

Similar attempts have been made to obtain implicit social views through examination of jury awards for death and disability. Here again a remarkably wide range of values has been found. It appears, therefore, that implicit values obtained from either public investments in safety or from the courts cannot serve as a useful yardstick for measuring the value of a life. Furthermore, these indices are subject to the same fundamental criticism as is human capital, namely, that they assess the value of a life but do not assess the value of saving a life.

c. ***Willingness-to-Pay*** Over the last decade, there has been a growing interest in the concept that public programs relating to health can be evaluated by determining the willingness of an individual to pay for a particular reduction in the risk of death (or illness). When such an expression is aggregated across the population it can provide the basis for assessing the benefits of a given investment in safety. Many economists favor this approach on the grounds that persons know best their own interests and therefore that their views concerning the value of life-saving activities can provide the most reliable basis on which to make policy decisions. As a measure, willingness-to-pay has the advantage that it does not necessarily force either society or the respondent to put a value on a life.

In this section we consider briefly the two strategies that have been proposed for determining willingness-to-pay, the first based on the use of questionnaires and the second based on wage differentials in riskier-than-normal occupations.

Many investigators believe that willingness-to-pay can be elicited by means of questionnaires that ask the respondent to value a particular statistical reduction in morbidity or mortality. However, only very limited empirical data are available for analysis and criticism. For this reason, the validity of the questionnaire method remains an open issue. It does seem, however, from what little information is at hand, that willingness-to-pay increases in response to an increasing probability of death and also (as would be anticipated) in response to the promise of greater reductions in the likelihood of death or illness. These changes in willingness-to-pay are not linear, however, and for this reason one cannot extrapolate empirical findings from one range of probabilities to another.

It should also be appreciated that the individual's willingness-to-pay can do no more than represent the lower bound of what a program is worth because it ignores all externalities; it is evident that family, friends, and others in society, in most instances, would themselves be willing to pay something in order to reduce a particular individual's risk of death or disability. Any complete measure of benefits should include these additional values.

Use of questionnaires has also been criticized on grounds relating to both equity and reliability. It is argued that this method gives undue weight to the views of the affluent; willingness-to-pay, as would be expected, increases with income and wealth with the result that the opinions of the more affluent would have more influence than those of the rest of the population.[18] There is also concern that most individuals may not be able to fully understand the problem that they are asked to consider. The reductions in the risk of death produced by most public programs are extremely small and it is not clear that individuals can comprehend very small changes in low-probability events. The questionnaire method has been further criticized on the grounds that individuals' responses may be influenced by the fact that they are not actually being asked to pay for the program. It is possible that their answers would be quite different if they knew that their taxes would be raised on the basis of their responses or that they would receive bills for the amount that they had indicated they would be willing to pay. Such issues require extensive further study before the questionnaire technique can be adequately evaluated.

Attempts have been made to estimate willingness-to-pay indirectly by looking at wage differentials in jobs that involve more than average risks (e.g., switchmen, lumberjacks, miners). Such studies have shown that for an increased risk of death of 0.001 per year, workers were on average paid an extra $200 per year (in 1954–1965 dollars). This finding indicates that each worker would presumably be willing to pay at least $200 per year (in 1976 dollars)in order to remove the 1 in 1000 extra risk of death. This value, derived as it is from the real world of the labor market, would appear on first consideration to provide an important guideline for policymakers. However, estimates of willingness-to-pay based on wage differentials have been criticized on several grounds. It has been suggested, for example, that individuals working in hazardous occupations are relatively poor and that they are therefore forced to take jobs that they otherwise would not; thus, it cannot be assumed that their attitude toward risk reflects the attitude of the population in general. It has also been argued that such individuals are less likely to be well-educated and well-informed; hence, they are unlikely to be aware of the real risk to which they are exposed. For these, and a variety of other reasons discussed elsewhere, the labor market figures must be viewed with caution.

---

[18] In theory this income effect could be eliminated by using weighing factors that normalized the elicited values.

d. *Summary* From the foregoing discussion it should be clear that there is at present no single reliable and generally accepted way of placing a dollar value on the benefits that will be realized under a public program that reduces mortality or morbidity. Of all the techniques that have been proposed, willingness-to-pay seems the most promising although there are serious practical and conceptual difficulties in its application.

D. DISCOUNTING AND THE FUTURE

1. Introduction

Present benefits are usually considered more "valuable" than those same benefits in the future, and future costs are usually preferred to incurring those same costs in the present. The fundamental reason for this is that a dollar not "consumed" today can be invested in productive uses to yield more dollars tomorrow.[19] That is, both present benefits and future costs imply that resources will be available for consumption, production, or investment in the interim period. Thus, not only are the magnitudes of benefits and costs important, but also the timing of their occurrence is critical to analyses of environmental decisions. While there is little dispute over this, there has been substantial controversy over what discount factor should be used to convert future benefits and costs to present values.

2. Choice of a Discount Rate

There are basically two schools of thought with regard to determining a social discount rate. The first might be called the "private opportunity rate school." This school believes that since the source of funds for public programs (e.g., environmental protection) is ultimately the private sector, the benefits and costs of the programs should be discounted by the private opportunity rate, i.e., by the rate of return on investment in the private sector. Ideally, then, it follows that this rate of return would characterize the opportunity cost of shifting productive resources out of the private sector. In practice, however, the analyst is faced with the problem of determining the "true" opportunity rate, since rates of return vary considerably throughout the private sector due to market imperfections.

---

[19] Inflation is a separate issue, and one should think of all dollars as being expressed in real terms, relative to their purchasing power.

The second school advocates the "social time preference approach." This school believes that individuals in the present generation would collectively agree to provide future generations with benefits in excess of what would be reflected by investments made in the private sector.[20] If one accepts this view, some explicit (perhaps political) procedure would be needed to determine overall rates of growth, investment, and discount for society. The question then is how to make this approach operational. Conceptually, the government could, through appropriate monetary and fiscal policy, drive down the interest rates throughout the economy to correspond to some predetermined social rate. However, many believe that in practice this may not be feasible.

To some degree, the resources used for an environmental project will force the displacement of private investments. Presumably those investment opportunities would have been evaluated at a different (probably higher) rate of return than the social rate of time preference. In order to determine if the shift in productive resources is economically efficient, the same rate used to evaluate the time stream of project results must also be used to evaluate the opportunities foregone in the private sector.[21] The shift of resources is socially desirable only if the present value of project results per dollar outlay in the public sector exceeds the present value of the opportunities foregone per dollar in the private sector—both present values being computed at the social rate of discount.

In practice, then, there are two basic issues that must be resolved in order to evaluate the time stream of a public project's results. The first concerns the determination of a social discount rate (social rate of time preference). The second relates to ascertaining what opportunities would be foregone elsewhere in the economy as a result of the investment in the public sector.

---

[20] Technically this means that present individuals regard consumption of future generations as a "public good."

[21] The goal is to avoid the inefficiencies inherent in a two-rate system in which resources would be shifted from higher yield (private) to lower yield (public) programs.

3. *Intergenerational Transfers*

All environmental decisions are evaluated from the point of view of present consumers. In some sense, then, discounting future benefits and costs, represents discrimination against future generations. The ethical dilemma surrounding future generations arises from the fact that they are not here to "vote" on decisions that will affect their lives (and life expectancies).

At least two approaches to the problem of intergenerational equity have been forthcoming. The first advocates that, if possible, each "generation" be placed in a position to revise ongoing programs. Unfortunately, many environmental programs are not subject to simple revision from one generation to the next. The second (which is applicable to situations that are not easily revised and perhaps involve irreversible consequences)[22] recommends that intergenerational considerations be explicitly taken into account in the decision. For example, Krutilla and Fisher (1975) discuss the possibility of levying a severance tax on the extraction and consumption of exhaustible resources.

There are, to be sure, issues of intergenerational equity that no approaches can satisfy, but *interpersonal* equity questions arise in the evaluation of all public investments and are not unique to intergenerational or life-saving issues. Thus, the dilemma resembles that for all public decisions. However, as discussed in the next section, where life itself is at stake, the moral aspect becomes of prime concern.

4. *Discounting Future Lives*[23]

Before discussing the rationale for discounting future lives or life years, one must set aside the question of whether later years of life are worth more or less than early years, because it is not a present versus future issue and is best handled independently of discounting.[24] Throughout this discussion, the life measure will be age-adjusted, quality-adjusted life

---

[22] The reader is referred to the discussion of reversible and irreversible consequences in Section II.D.5 of this appendix.

[23] Much of this discussion is taken directly from Raiffa, H., W. Schwartz, and M. Weinstein (1976) On Evaluating Health Effects of Societal Programs; prepared for the Committee on Environmental Decision Making.

[24] Age is obviously an important factor in determining the quality of life. Holding all other health effects constant, the question is whether a 50th year of life is worth more, or less, than a 70th year. There are arguments on both sides of the issue, but the main problem is that other health effects are not constant. The average health level of a 50-year-old is higher than that of a 70-year-old. This, in principle, should be taken into account in valuing life years.

One method would be to develop a standard deflator of average health status by age, and years. The trade-off, then, is between saving a 50-year-old this year versus a 50-year-old next year. The basic question is whether one should discount future life years relative to present (age-adjusted, quality-adjusted) life years in evaluating public investments. The answer, it shall be argued, depends on the opportunities available for investing resources for future use, and on the future opportunities that will be available for using those resources to save lives.

A simple example demonstrates why future life years ought to be discounted. Begin with the standard economic assumption that one dollar productively invested today can yield $(1+r)^t$ dollars t years from now (r is then the effective rate of interest). Suppose society can spend $10,000 now to save one life year T years from now. It can be shown that this is equivalent to spending $10,000 to save less than one life year *immediately*, i.e., it is equal to saving $(1+r)^{-T}$ life years now.

Note that spending $10,000 now for one life year in year T is equivalent to spending $\$10{,}000(1+r)^T$ in year T for one life year in year T. Furthermore, spending $\$10{,}000(1+r)^T$ in year T for one life year in year T is equivalent to spending $\$10{,}000(1+r)^T$ now for one year of life now. That is, the dollar value of a *concurrent* life year is "time invariant," i.e., it remains constant over time, or in terms of opportunity cost, the dollar cost of saving a life year at the margin remains constant over time. Finally, note that spending $\$10{,}000(1+r)^T$ now for one life year now is equivalent to spending $10,000 now for $(1+r)^{-T}$ life years now. The only assumption needed for this final step is a linear relationship between dollars and quality-adjusted life years at a given point in time.[25] No assumptions were needed as to the enhanced value of present versus future life years; on the contrary, it was assumed that life years have constant value in *current* (i.e., at the time they are spent) dollars.

The time-invariance assumption noted above has certain implications. First, the assumption actually implies not so much that future lives will be valued the same as they are now, but that investment opportunities to save lives will also be the same. This stems from the fact that the dollar value society attaches to an additional year of life would also reflect the marginal cost of saving that year if all desirable investments were being

---

to use this deflator to contract the scale of health status for each year of life. Thus, the health status resulting from some particular effect might be measured on a scale from 0 to 1 for a 20th year of life, but on a scale from 0 to 0.85 for a 70th year of life. This would reflect the judgment that, on average, a 70th year is of lower quality than a 20th year.

[25] Lack of linearity would alter the exchange rate, but would have no effect on the need to discount.

undertaken. If the life-saving opportunities are relatively stable, the time-invariance assumption is reasonable. If the investment under consideration, and its consequences, are small enough on a global scale so as not to affect the value of a life at the margin, then discounting is still appropriate.

If, however, the opportunities, and hence marginal costs, of saving lives are not time-invariant, we must be wary of discounting. If, *overall*, life-saving opportunities are improving, society should discount even more; if, *overall*, life-saving opportunities are diminishing, society should discount less or not at all. The irreversibility of an individual decision, unless it is so large as to affect the marginal social cost of life-saving, should *not* affect the decision to discount, any more than the secondary effect of a large economic investment on the capital market and the interest rate should affect the choice of the discount rate. Where the "secondary" effect is truly major, however (as would be the case for a cataclysmic environmental disaster), then the marginal costs of life-saving will be rising, and the appropriate discount rate may be zero, or even negative.

For example, discounted at 5 percent per year, the loss of a billion lives 500 years from now would be comparable to less than one life now. Are these really to be considered equivalent? If they are not, the reason lies in part because the opportunities will not exist to save a billion lives at reasonable cost in the future, and in part because other values come into play when one considers such a major cataclysm. To save a billion lives would, no doubt, force our descendents 500 years from now to move far out along the marginal cost curve for life-saving; the opportunity will not exist to save that many lives at the same average cost as to save, say, a thousand lives. Therefore, for the reasons given above, the effective discount rate society should use in valuing those lives should be smaller than the rate used to value smaller numbers of lives. Moreover, when perhaps 10 percent of the world's population is at risk of destruction, other values come into play: our concern for human civilization itself, apart from the individual lives involved. For both of these reasons, it is clearly inappropriate to discount cataclysmic life loss in the same manner as more moderate life loss. By the same token, arguments based on such cataclysms should not dissuade us from appropriately discounting future lives in most instances.

Discounting does not reflect lessened concern for future generations, but rather the opportunity to forego investments far in advance of the life to be saved in order to have more resources available closer to the time at which the life is actually lived. Future generations may not want us to have squandered resources to reduce their mortality now. If they will have more efficient opportunities to save lives, then society should do them a favor by discounting them even more.

5. Reversible and Irreversible Consequences

Some environmental decisions have associated with them consequences that for all practical purposes can be regarded as irreversible.[26] Consider, for example, the decision to permit pollution of waterways by nondegradable contaminants such as mercury. Current scientific knowledge can do little to influence whatever effects might be associated with this form of water pollution. The analysis of environmental decisions having possibly irreversible consequences poses important theoretical and practical issues. This section discusses how these issues might be treated.

It is useful to think of irreversibility as representing a reduction in the future options available. Then, one is confronted with a clear-cut illustration of a central postulate in welfare economics—namely, that an expansion of choice represents a welfare gain; a reduction of options, a welfare loss. Clearly, the importance of irreversible consequences lies in the fact that they can lead to significant reductions in general welfare.

It has probably occurred to the reader that absolute irreversibility may represent an extreme case. In many instances, there may be some possibility of restoration, perhaps at high cost. In such cases, three important considerations should be evaluated. The first concerns the probability or likelihood of wanting to reverse the decision. The second concerns the length of time in which the "irreversible" consequences would be felt, i.e., the duration of welfare loss. The third involves the fidelity and acceptability of the restored state.

Using a simple model, Krutilla and Fisher (1975) have analyzed the development of resources found on public lands where such development has irreversible consequences. In their model, they account explicitly for the foregone benefits emanating from the preserved "state of nature." A not surprising conclusion of their analysis is that the "optimal" commitment of resources to activities that are *irreversibly* destructive of the environment is smaller than commitments to activities whose consequences are reversible—even if future demands and outcomes are known with certainty. Furthermore, this conclusion is strengthened if there is uncertainty as to either the magnitude of the consequences of their values over time. Thus, with regard to these types of environmental decisions, it may be wise to forego the programs if they have possible irreversible consequences, even if a more conventional comparison of discounted benefits and costs appears favorable.

---

[26] This discussion is based in large part on the work of Krutilla and Fisher (1975). It should be noted that although this research is relevant to decisions designed to *enhance* environmental quality, their primary emphasis was focused on the *preservation* of natural environments, e.g., decisions banning the extraction and consumption of exhaustible resources.

6. Option Value

It has been suggested that where the demand for a publicly provided good or service is uncertain, there may be benefits to a risk-averse individual from retaining the *option* to consume, in addition to the benefits captured under the conventional willingness-to-pay doctrine.[27] The value of these additional benefits has been termed option value.

As a practical matter, the notion of option value is only important in evaluating decisions that could result in irreversible consequences. Thus, a proposed water pollution control program designed to enhance the water quality in Lake Erie might have significant "option value" attached to it. For example, it may generate outputs (such as recreation and other aesthetic uses) for which the future demand is uncertain, and the decision not to undertake the program may be, for all practical purposes, irreversible. That is, if the program is not presently initiated, it may be impossible to improve the water quality except possibly at prohibitively high cost.

Thus, when there is reason to believe that option value exists, there is an additional incentive to avoid environmental decisions having possibly irreversible consequences. That should not be interpreted as suggesting that activities involving irreversible consequences should never be undertaken. Rather, the point is that irreversibility coupled with risk aversion leads to a reduction in the present value of the activity being contemplated.

As is apparent in these discussions, it is often difficult to make quantitative normative statements with respect to carrying out analyses of this category of environmental decisions. Qualitatively, the upshot of these discussions conforms to intuition—uncertainty, irreversibility, and risk aversion all imply a conservative policy in evaluating environmental decisions.

---

[27] See Section II.B.2 of this appendix.

E. ALLOWANCE FOR UNCERTAINTY

1. Introduction

Uncertainty pervades most environmental decisions and affects analyses of such decisions in two ways: (1) the analyses rest on imperfect data and inadequate scientific understanding. For example, it may not be known precisely how a given reduction in particulate emissions will change the ambient level of suspended particulates, or how that change will affect the health of an exposed population; and (2) the consequences of the decision cannot be foretold with precision. Since every decision entails risk and since some alternatives are riskier than others, this means that it is difficult to determine how much risk is worth accepting. Although there are few generally accepted principles for handling uncertainty and risk, there are some fruitful approaches to the problem.

2. Probabilistic Evaluation[28]

Since in most cases some action must be taken, experts should convey to less knowledgable individuals the information they possess even though it may be imprecise. Nothing much is gained by further complicating the information-exchange process by purposely introducing vague, possibly protective language. For example, suppose scientist *A* is the world's leading expert about a given phenomenon. Scientist *A* thinks action *X*, if taken, will possibly lead to a number of deaths. If pressed, scientist *A* might think roughly that the number is somewhere about 100 but that it could possibly be between 10 and 1000. Being uncertain, the scientist might write, "I think there may be *quite a number* (or 'a substantial number' or 'not an insignificant number,' or . . .) of deaths involved." Now these so-called, semi-quantitative terms may be dysfunctionally misleading—especially if some readers, on the basis of this report, start thinking in terms of 10 or 20 deaths and others in terms of 10,000 or 15,000. It would be far better if scientist *A* said something to the effect that, "I feel uncertain, but my best guess is about 100, but I would not be surprised if the number were as low as 10 or as high as 1000." This would be an improvement, but still it also may be misleading since the reader might be confused about what is meant by "best guess" or by the expression "would not be surprised."

[28] Much of this section is taken from the paper by Raiffa, H., W. Schwartz, and M. Weinstein (1976) On Evaluating Health Effects of Societal Programs; prepared for the Committee on Environmental Decision Making.

It is worth the effort to be precise about the state of imprecision. This can be accomplished if analysts report a few selective fractiles of their judgmental probability distributions (e.g., the 0.01 and 0.99 probability tail values, the quartiles, the median) or if they present easily understood graphical displays of the probability distributions. Equally important, ample warnings should be appended to give the audience a sense of perspective: how were these numbers chosen and how volatile are they?

There are a number of reasons why probability assessments are important:

- Probability assessments are more precise in conveying uncertain information than vague semi-quantitative terms, such as: less likely, rarely, seldom, quite a few, not so many . . . .
- Probability numbers are precise enough to be attacked by others. It is hard to start a debate over ambiguous reports that can mean different things to different people.
- If an uncertain quantity, x, can vary over a wide range and if sensitivity studies show that it really matters where x lies, then it may be important to know where the experts think x lies within that range.
- Probabilities can be combined with other probabilities to simplify and clarify a morass of numbers. If joint dependencies are critical, then the probability language is rich enough to capture these nuances.
- Probabilities can be combined with quantitative evaluations of consequences so that one can compute distributions of final payoff measures.
- It is important to think about *probability dynamics*: about the modification (and the anticipated potential modifications) of probability distributions over time. Thus, for example, if x is an uncertain quantity with a broad distribution and if payoffs are sensitive to the level of x, it is relevant to know the ways in which further research might modify the distribution of x. If the modification is anticipated to be negligible, it might be desirable to act now; if the modification could turn out to be substantial, then waiting for this information before making an irreversible decision may be a prudent course of action. A full dynamic, probabilistic analysis should systematically address such concerns.

Many of the reasons cited above extolling the virtues of probability as a language of discourse can be reversed: just because probabilities are relatively unambiguous they are administratively dangerous to use in a politically charged arena. If clarity invites criticism, is this desirable? And so on.

F. DISTRIBUTIONAL CONSIDERATIONS[29]

1. Introduction

As discussed in Section II, Part B of this appendix, the benefits (costs) of an action can be thought of as the increase (decrease) in some desirable component of "general welfare" that results from taking the action. Although this concept seems straightforward, in most cases a policy analyst is not dealing with "general welfare," but rather with the welfare of specific groups of individuals, industries, and so on. Furthermore, an action may cause the welfare of some groups to fall. Thus, policymakers must consider the *net* effects of their actions as well as the distribution of the effects. The practical difficulty in assessing such effects then becomes one of isolating the "net" increase or decrease in general welfare. In aiding this exercise, it is often useful to distinguish between aggregative effects and distributional effects.[30]

Aggregative effects usually refer to results of a project or action that increases directly the well-being of individuals or decreases the amount (cost) of resources required to produce goods and services. In the previously cited water quality example, all the items listed can represent aggregative results. Distributional effects, on the other hand, usually refer to changes in some people's well-being at the expense of the well-being of others. For example, suppose increased water recreation opportunities bid up the price of boat rentals and the owners of the boats experience increased profits. The increased profits would not necessarily represent aggregative benefits, since they would represent a dollar-for-dollar "loss" to the renters of the boats. The situation can be thought of as an income transfer from the boat renters to the boat owners. There is no reason to expect any net increase in the general welfare. Thus, in performing analyses of environmental decisions, care must be taken to distinguish between the aggregative effects that represent real net increases in the general well-being and strictly distributional effects that represent trade-offs between the well-being of different individuals or segments of society.

---

[29] Some of this discussion is based on a paper by Paul Portney (February 1976) The Distribution of Pollution Control Costs: A Literature Review and Research Agenda. Resources for the Future, unpublished.

[30] The distinction between aggregative and distributional effects is sometimes referred to as "real" versus "pecuniary" effects.

2. *Distribution Across Income Groups*

The most frequently discussed distributional issue probably involves the apportionment of taxes across different income groups. In characterizing this issue it is often useful to calculate taxes as percentage of household income. If one does this for various income brackets, it can be determined whether the taxes in question are distributed progressively, proportionally, or regressively. That is, one can discover whether the taxes (as a percentage of income) rise, remain constant, or fall, as income increases. An analogous situation applicable to the environmental area would be an assessment of the distributional impact of pollution control costs. For example, a policymaker might wish to determine whether control costs (as a percentage of income) rise, remain constant, or fall, as income rises. Why is such a determination of interest?

Public policies must usually be financed by some means of taxation. The policy issue becomes one of determining what desired attributes such financing should involve. For example, should a public policy be financed on the basis of the "ability to pay," or should there be a direct link between program benefits received and program costs (taxes) imposed? This issue is especially relevant in the area of environmental decision making, since many decisions in this area result in benefits spread across large segments of society. For example, control programs designed to improve ambient air quality may affect large geographical regions. Clearly, such areas are made up of households covering the spectrum of possible income profiles. Policymakers may be interested in the question of whether such programs should be financed by taxes imposed on those who benefit the most from improved air quality, or whether they should be financed out of more general tax revenues.

A related issue concerns distributional considerations across levels of government. For example, should the federal, state, or local government be responsible for bearing the costs of a particular air pollution control program? The resolution of this question is closely tied to the policymaker's objectives with regard to the program's effects on the distribution of income.[31] Unfortunately, it is often difficult to isolate these effects since different levels of government rely on different mixes of revenue-producing mechanisms, e.g., income taxes, sales taxes, property taxes, and so on. What is being stressed here, is not a normative judgment as to the methods of financing, implementation, and enforcement. Instead, what is being said is that analyses of alternative environmental programs should include a display of the related distributional effects. That is, policymakers should be aware of the distributional implications of the alternative policies being decided upon.

---

[31] From the policymaker's perspective, it may be more important to determine which level of government will be most efficient in implementing and enforcing the control program.

3. Distribution Across Geographical Regions and Jurisdictions

By definition, most decisions involving the environment can be thought of as affecting a region with certain geographical boundaries. At the same time, the relative impacts of a given decision may vary to some degree within that region.[32] Thus, national policies designed to clean up air pollution related to emissions from the automobile will affect all parts of the nation to some degree, although they will have the most significant effects in areas where mobile-source air pollutants are predominant factors in determining air quality. That is, auto emission controls may dramatically improve the air quality in Los Angeles, but may have inconsequential effects on the air quality in a rural area of Wyoming.

Environmental decisions requiring auto-emission control systems are made in a political arena composed of representatives from jurisdictions that have fixed boundaries. Thus, there is a potential conflict when affected regions do not coincide with well-defined jurisdictions or when uniform national policies are adopted with differential impacts across regions or jurisdictions. Again, the policy question becomes one of how the distribution of benefits from a program should correspond to the distribution of costs imposed by that program. That is, in the example above, should the citizens of Wyoming bear the costs of cleaning up California's air? To evaluate this question, other factors must be analyzed. For instance, there may be significant economies of scale in producing only one "type" of automobile for the nation,[33] and this factor may outweigh equity considerations.

Elected officials must ultimately decide on the geographical scope of an environmental policy. However, in aiding this task, the policy analyst can provide valuable information on the regional and jurisdictional impacts of the alternative policies under consideration. This is important since presumably one wants to avoid incorporating adverse effects into the decision. For example, uniform national standards may be favored over regional standards in order to reduce the likelihood that different regional standards would result in industrial relocation, plant shutdowns, and significant regional unemployment due to labor immobility.

[32] Differences in climate, terrain, and other environmental factors contribute to the differential impact of certain environmental policies within and across "regions."

[33] However, it should be noted that multi-car strategies have been proposed as one means of controlling mobile-source air pollution, (see NRC 1974).

REFERENCES

Howard, R.A. (1966) Decision analysis: Applied decision theory. Pages 55-71, Proceedings of the Fourth International Conference on Operational Research, edited by D.B. Hertz and J. Melese. Sponsored by the Operations Research Society of America, August 29-September 2, 1966, Boston, Mass. New York: John Wiley and Sons.

Krutilla, J.V. and A.C. Fisher (1975) The Economics of Natural Environments: Studies in the Valuation of Commodity and Amenity Resources. Washington, D.C.: Resources for the Future, Inc.

National Research Council (1974) Air Quality and Automobile Emission Control. Volume 4, The Costs and Benefits of Automobile Emission Control. A Report by the Coordinating Committee on Air Quality Studies, Commission on Natural Resources, National Research Council, National Academy of Sciences, National Academy of Engineering, for the Committee on Public Works, U.S. Congress, Senate. Committee Serial No. 93-24. 93rd Congress, 2nd Session.

Peskin, H.M. and E.P. Seskin, eds. (1975) Cost-Benefit Analysis and Water Pollution Policy. Papers Prepared for a Symposium Sponsored by the U.S. Environmental Protection Agency and Conducted in Annapolis, Md. September 5-7, 1973. Washington, D.C.: Urban Institute.

Spetzler, C.S. and C-A.S. Stael von Holstein (1972) Probability Encoding in Decision Analysis. Management Science 22(3):340-358.

APPENDIX E

Case Studies Prepared for the Committee on Environmental Decision Making*

Robert Burt, "Effluent Limitations Under the Federal Water Pollution Control Act."
Nathan Karch, "Explicit Criteria and Principles for Identifying Carcinogens: A Focus of Controversy at the Environmental Protection Agency."
Raphael Kasper, "Automobile Emission Standards Suspension (1972-1973)."
Richard Lowerre, "Indirect Source Review: Rolling with the Punches."
Richard Lowerre and Roxanne Arnold, "Primacy Under the Safe Drinking Water Act."
Lawrence McCray, "Between Decision and Non-Decision: EPA's Assessment of the 'Suspect' Insecticide Carbaryl."
Lawrence McCray, "Mouse Livers, Cutworms, and Public Policy: EPA Decision Making for the Pesticides Aldrin and Dieldrin."

---

*The case studies are scheduled for publication in the summer of 1977 in a separate volume entitled Volume IIa Decision Making in the Environmental Protection Agency: Case Studies. The studies will be available in limited quantity from the Commission on Natural Resources of the National Academy of Sciences.

APPENDIX

F

Papers and Reports Prepared for the Committee on Environmental Decision Making[*]

Frederick R. Anderson, "Basic Strategies for Environmental Control."

Henry P. Anderson and John R. Goldsmith, "Peer Review and Openness of Information in the Process of Making Environmental and Other Technical Decisions."

[†]Stanley Bach, "Governmental Constraints on Environmental Regulation."

Blair T. Bower, "Economic Incentives and Disincentives in Residual and Environmental Quality Management."

James Butler, "The Science Advisory Board of the Environmental Protection Agency."

[†]Marsha N. Cohen, "Same Data, Different Results — A Study of the Use of Scientific Information in Legal Decisionmaking."

Robert Dorfman, "Formal Policy Analysis."

Sanford E. Gaines, "Decision Making at the Environmental Protection Agency: A Comparative Analysis of Informal Rule Making with Two Types of Hearing Procedures." Published in revised form in The Iowa Law Review, Volume 62, page 839 (1977).

Harold P. Green, "Alternative Decision Making Models."

N. William Hines, "Judicial Review of EPA Decision Making."

---

[*] Selected papers and reports are scheduled for publication in the summer of 1977 in a separate volume entitled Volume IIb Decision Making in the Environmental Protection Agency: Selected Working Papers. The papers will be available in limited quantity from the Commission on Natural Resources of the National Academy of Sciences. Papers not included in Volume IIb will be available for perusal in the archives of the National Academy of Sciences. Readers interested in obtaining copies of these documents should make arrangements with the archivist.

[†] Paper will be included in Volume IIb, Decision Making in the Environmental Protection Agency: Selected Working Papers.

N. William Hines, "Nondegradation Policy: Ten Years of Controversy." Published in revised form in The Iowa Law Review, Volume 62, page 643 (1977).

Ronald A. Howard, James E. Matheson, and D. Warner North, "Decision Analysis for Environmental Protection Decisions."

Marian Jelinek, "Report on the Organization of Research and Development: Technical Information and Policy-Making in the Environmental Protection Agency."

†Myra Karstadt, "A Study of Interacting Pollutant Systems: Regulation of the Sulfur Oxides Pollutant System."

†Allen V. Kneese, "Quantitative Comparison of Policy Instruments for Environmental Improvement."

D. Bruce LaPierre, "Technology-Forcing and Federal Environmental Protection Statutes." Published in revised form in The Iowa Law Review, Volume 62, page 771 (1977).

Steven Lieberman, "State and Regional Perspectives on the Environmental Protection Delivery System."

Richard Liroff, "EPA Review of Environmental Impact Statements."

†Richard Liroff, "Impact Statement Preparation by EPA."

Richard Lowerre, "Access and Protection of Information."

†Richard Lowerre, "Statutory Deadlines."

†Lawrence McCray and Steven Lieberman, "Paper Trails: A Review of EPA Decision Documents."

Alfred Marcus, "The Limitations of Comprehensive Environmental Management."

Michael Padnos and Edward I. Selig, "Transportation Controls in Boston: The Plan that Failed."

†Victoria S. Price, "State and EPA Regional Implementation of Pollution Controls."

†Howard Raiffa, William Schwartz, and Milton Weinstein, "On Evaluating Health Effects of Societal Programs."

Phillip D. Reed, "The Use of Economic Disincentives in Environmental Quality Management."

Jonathan L. F. Silver, "Problems in Attempting to Use Emission Limitations to Achieve an Acceptable Environment."

Jonathan L. F. Silver, "Toward More Effective Citizen Participaton in EPA Proceedings."

Richard Stewart, "Ambient Standard Setting."

Richard Stewart, "Judging the Imponderables of Environmental Policy: Judicial Review Under the Clean Air Act."

Richard Stewart and Phillip Spector, "Citizen Suits."

†Richard Stewart and Phillip Spector, "Least Cost Achievement of Environmental Quality Objectives."

Richard Stewart and Phillip Spector, "Procedural Formalities in EPA Decisionmaking."

†Scott J. Ullery, "The Environmental Protection Agency and the Kaiparowits Power Project: A Case Study of EPA's Performance of its Environmental Review Responsibilities."

---

†Paper will be included in Volume IIb, Decision Making in the Environmental Protection Agency: Selected Working Papers.